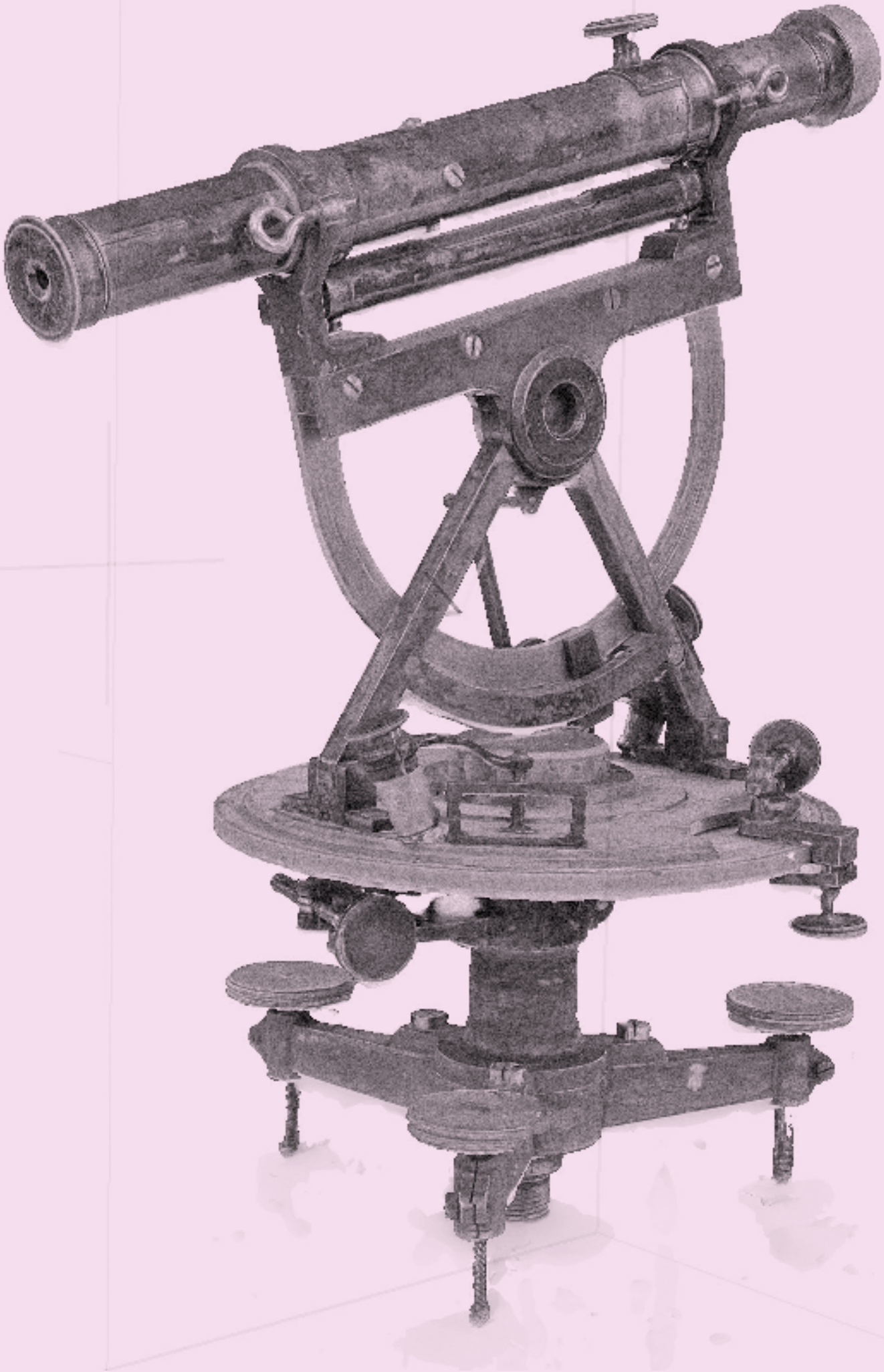
200 Years KIT 100 Objects

Parts of a Whole

Selected Objects from KIT's History

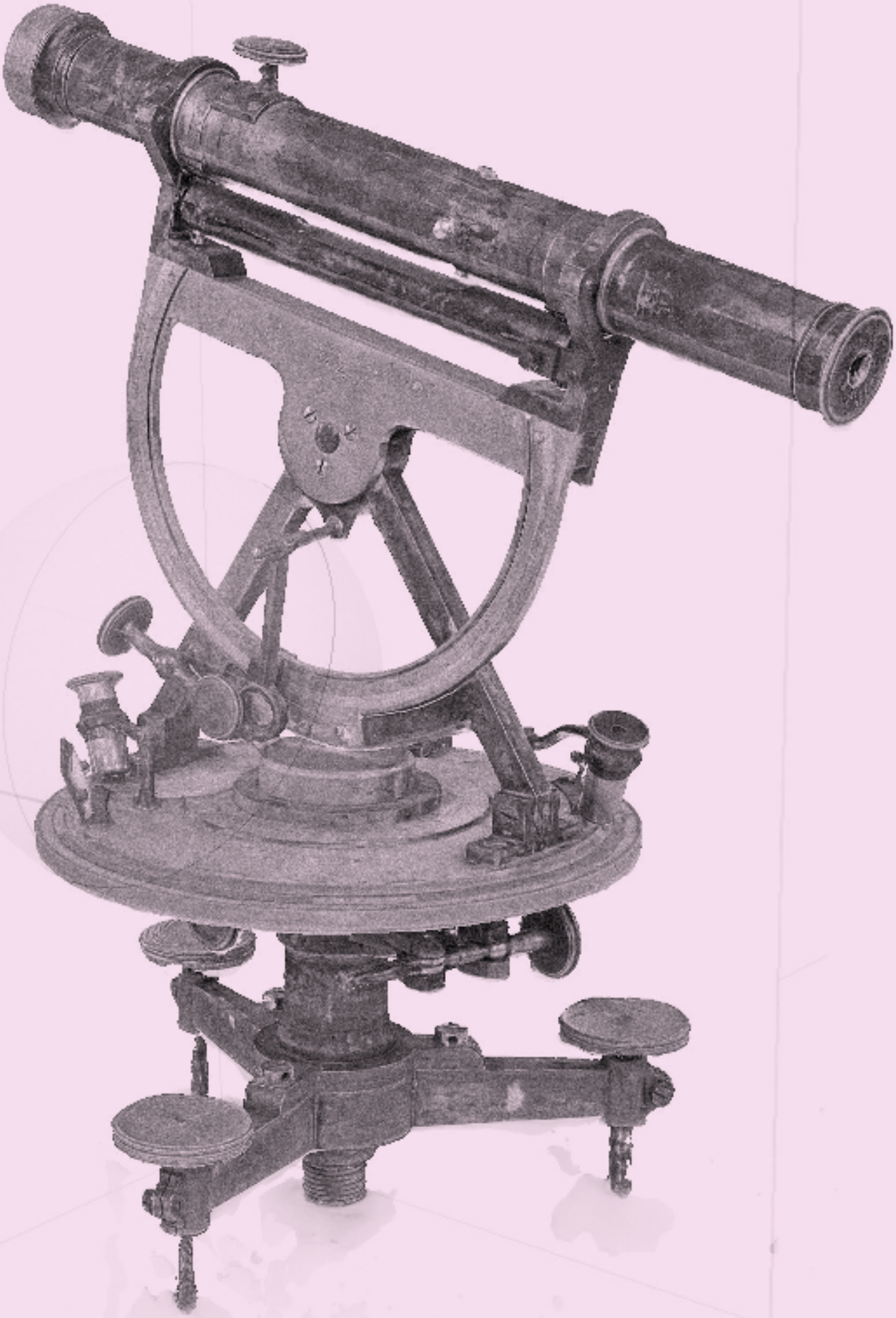
HATJE CANTZ

002 Theodolite ca. 1820 → p.185



3D-Scans, 2025

002 Theodolite ca. 1820

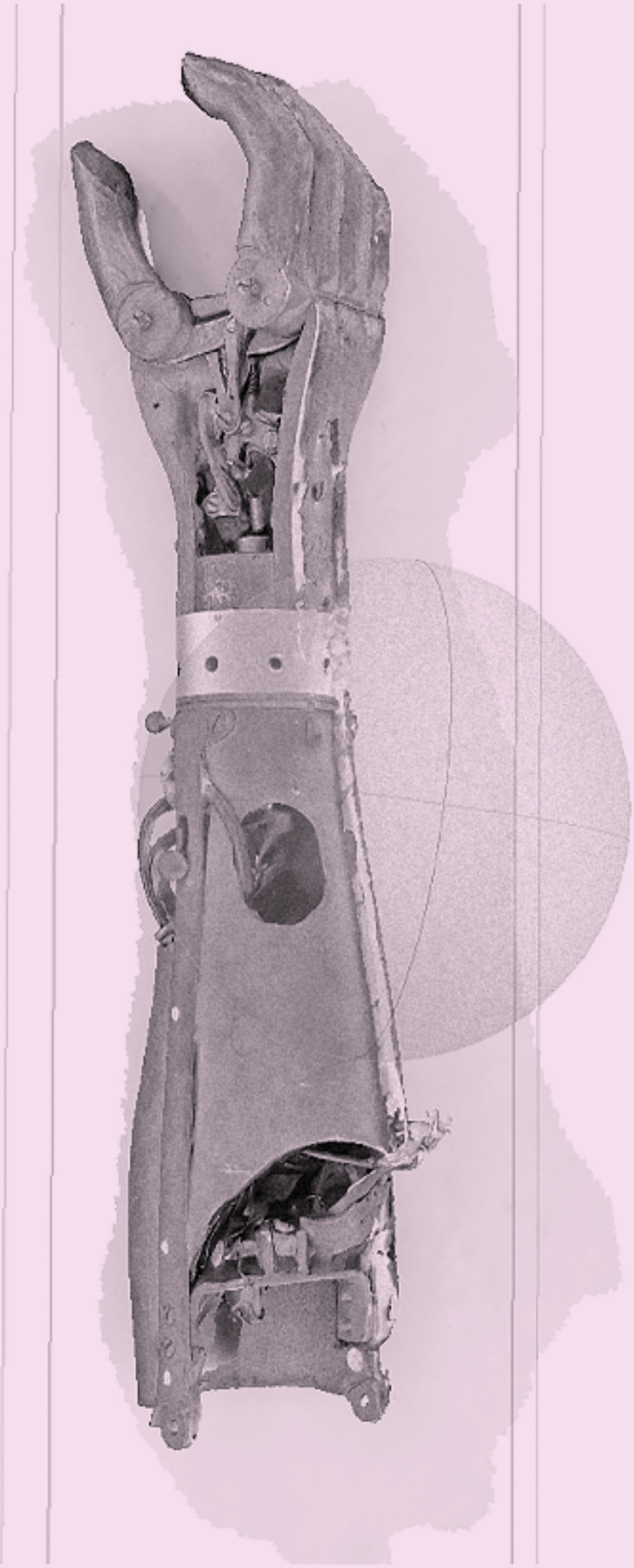


→ p.185

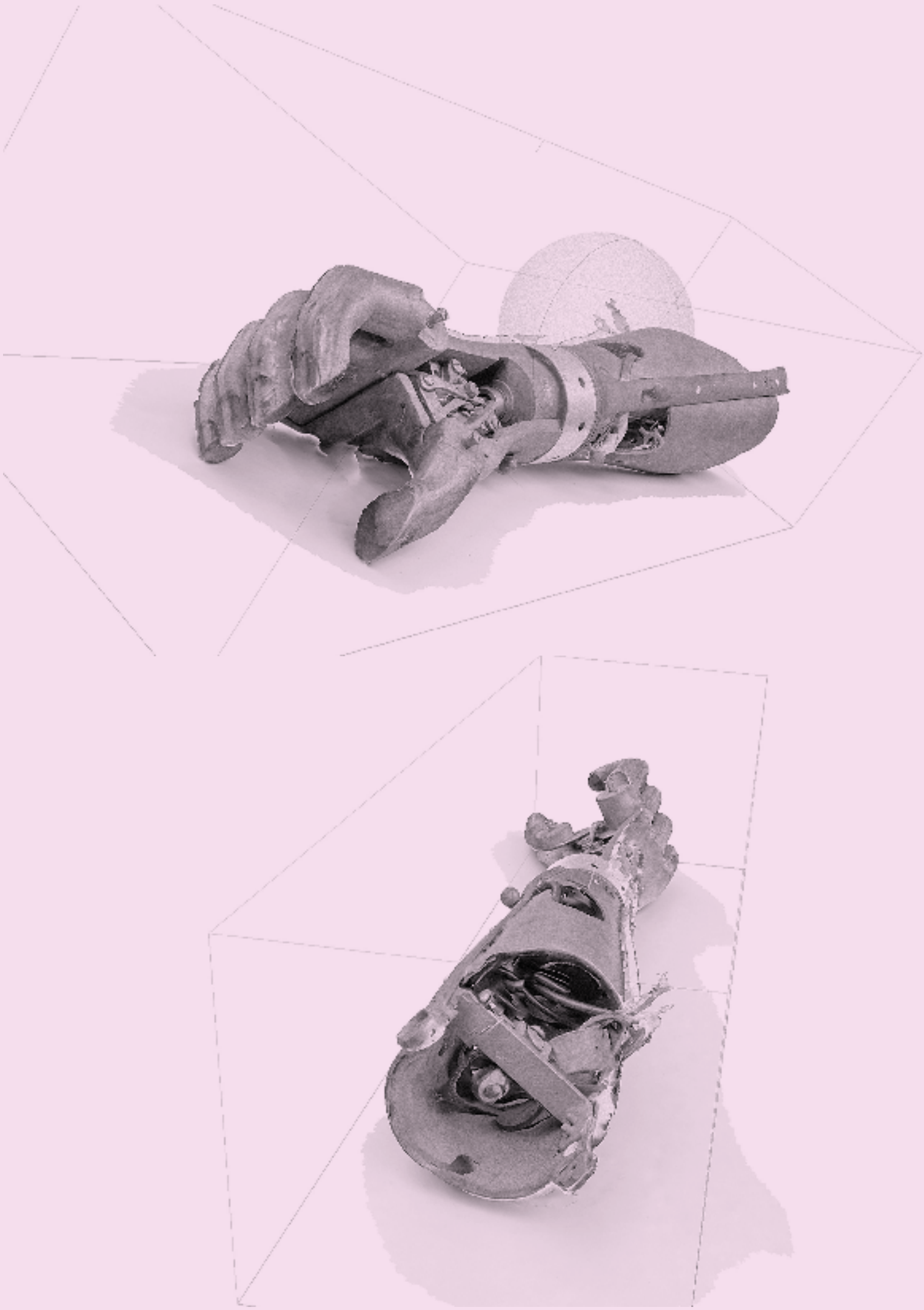


3D-Scans, 2025

007 Forearm Prosthesis ca. 1945



→ p.188



3D-Scans, 2025

019

Ferdinand Redtenbacher
Monument 1866



→ p.211



3D-Scans, 2025

020 Mathematical Thread Model 1887

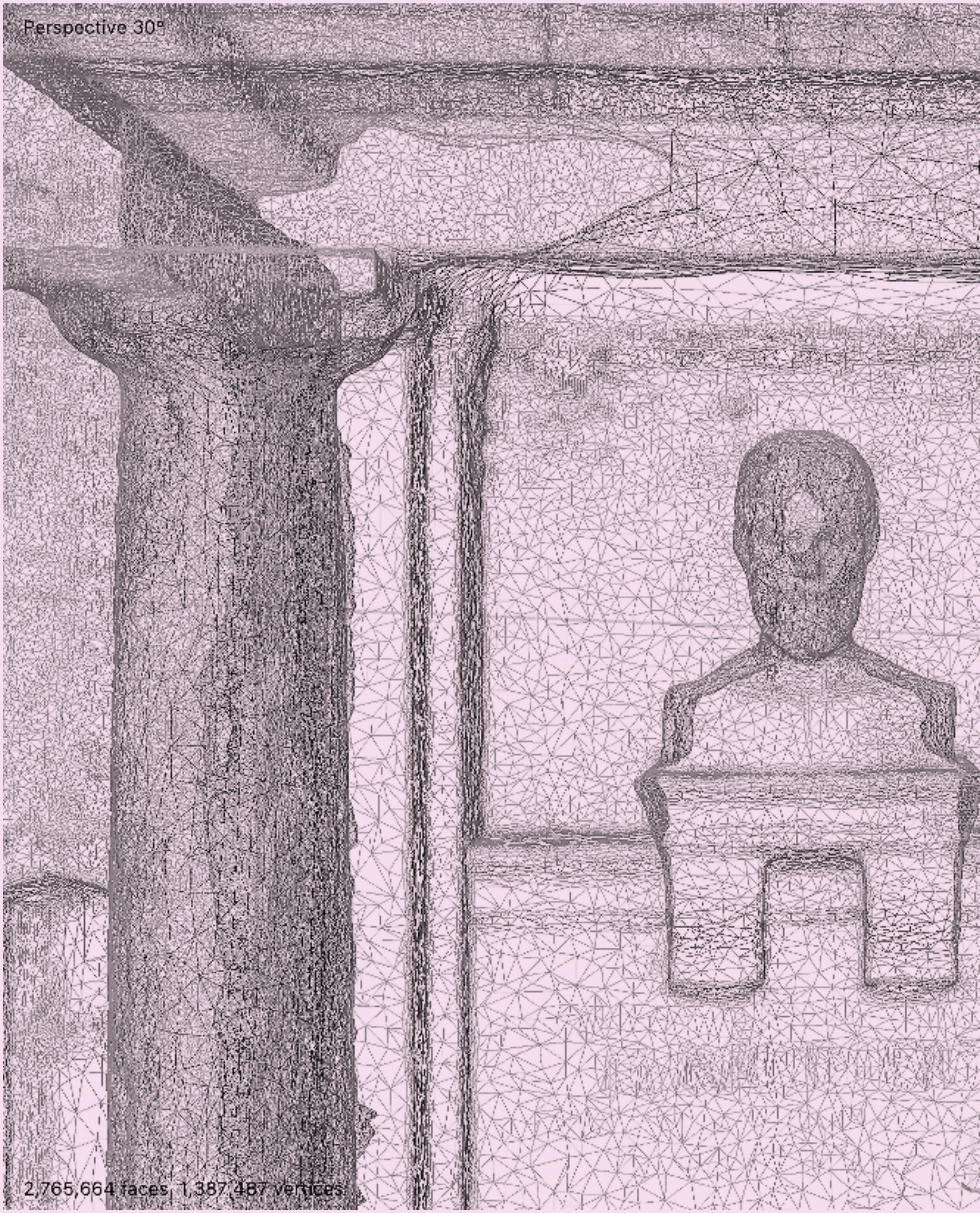


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3D-Scans, 2025

Heinrich Hertz Monument 1925



→ p.214



3D-Scans, 2025

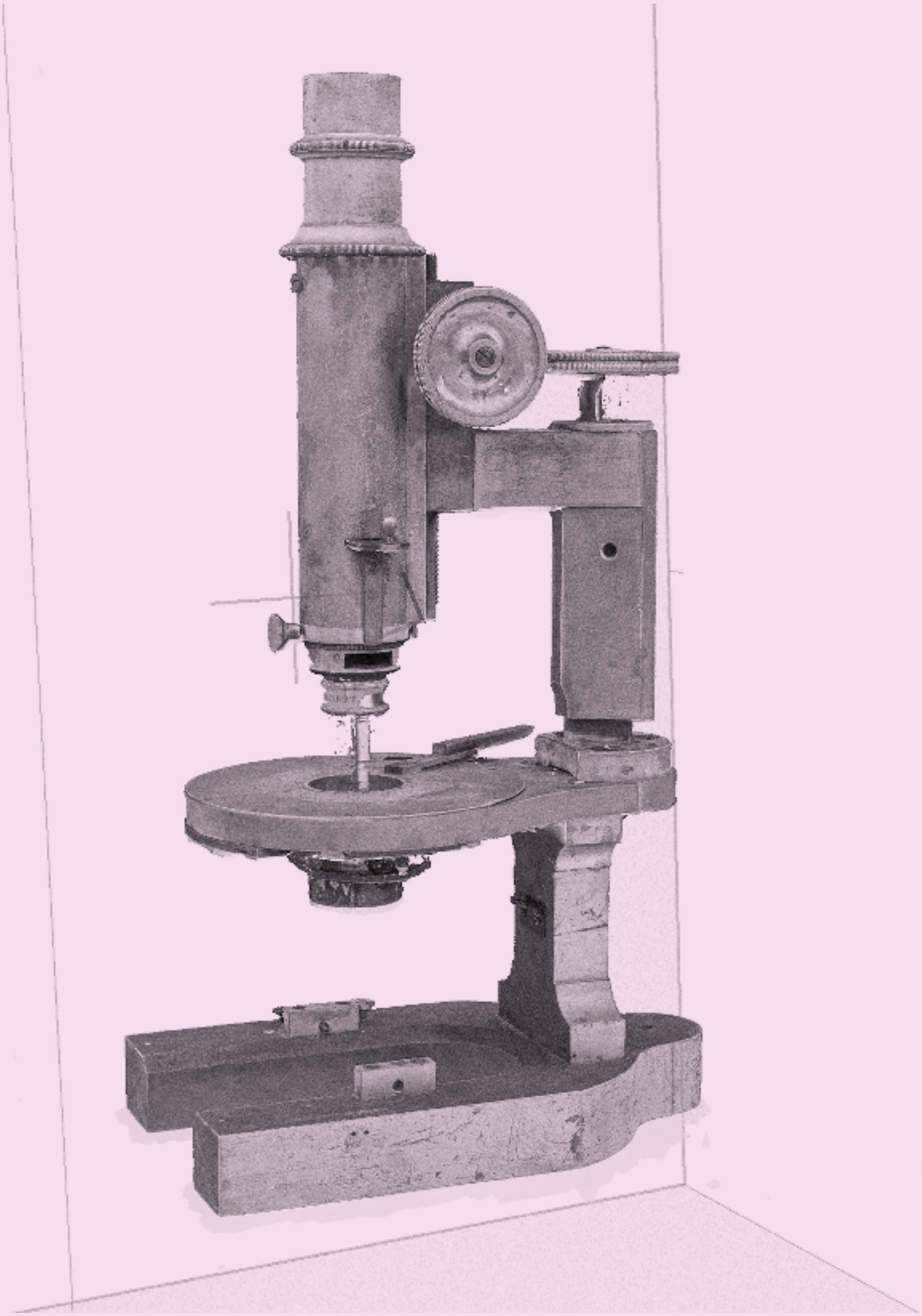
Heinrich Hertz Monument 1925

→ p.214



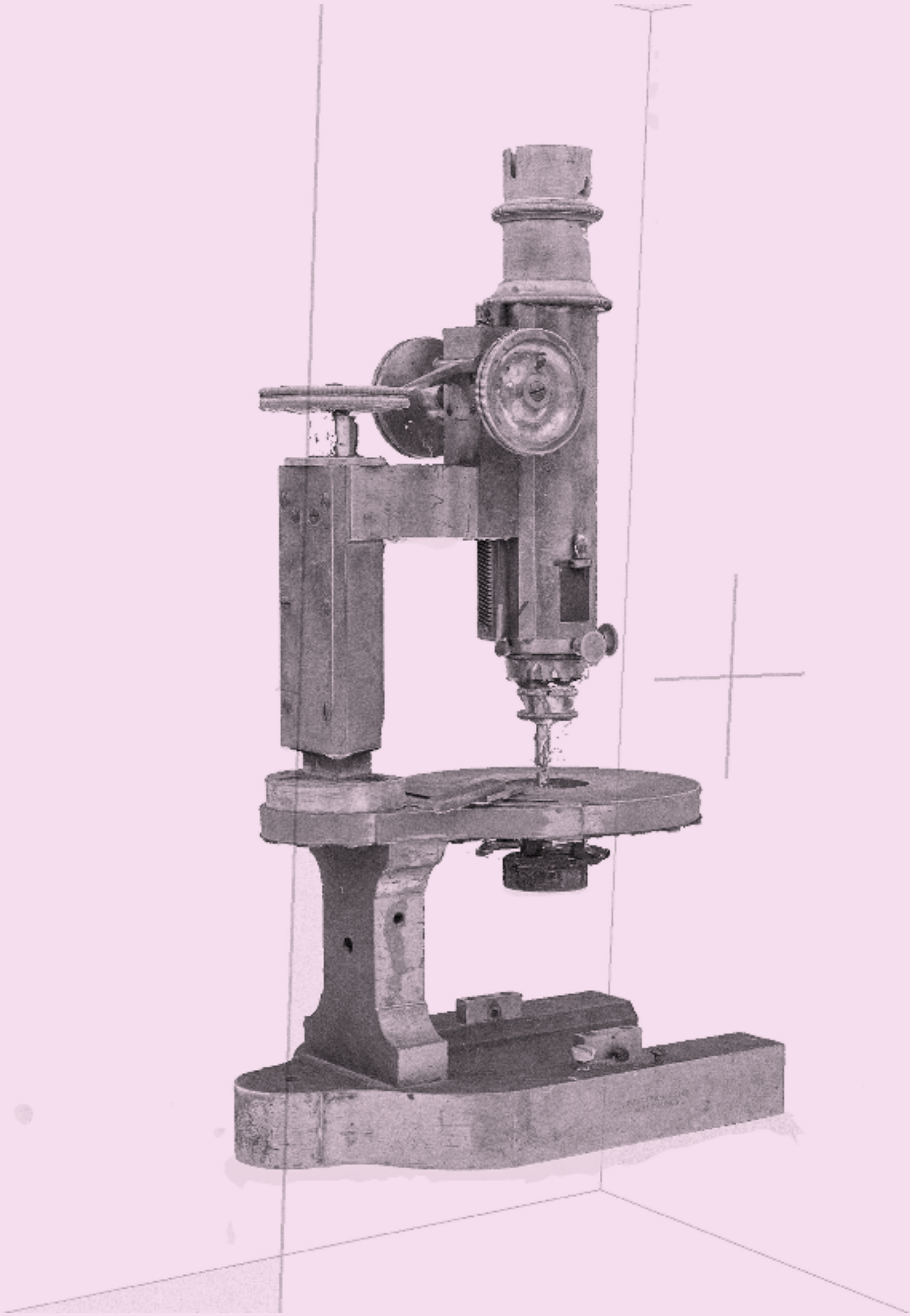
024 Polarizing Microscope from Liquid Crystal Research ca. 1890

→ p.216

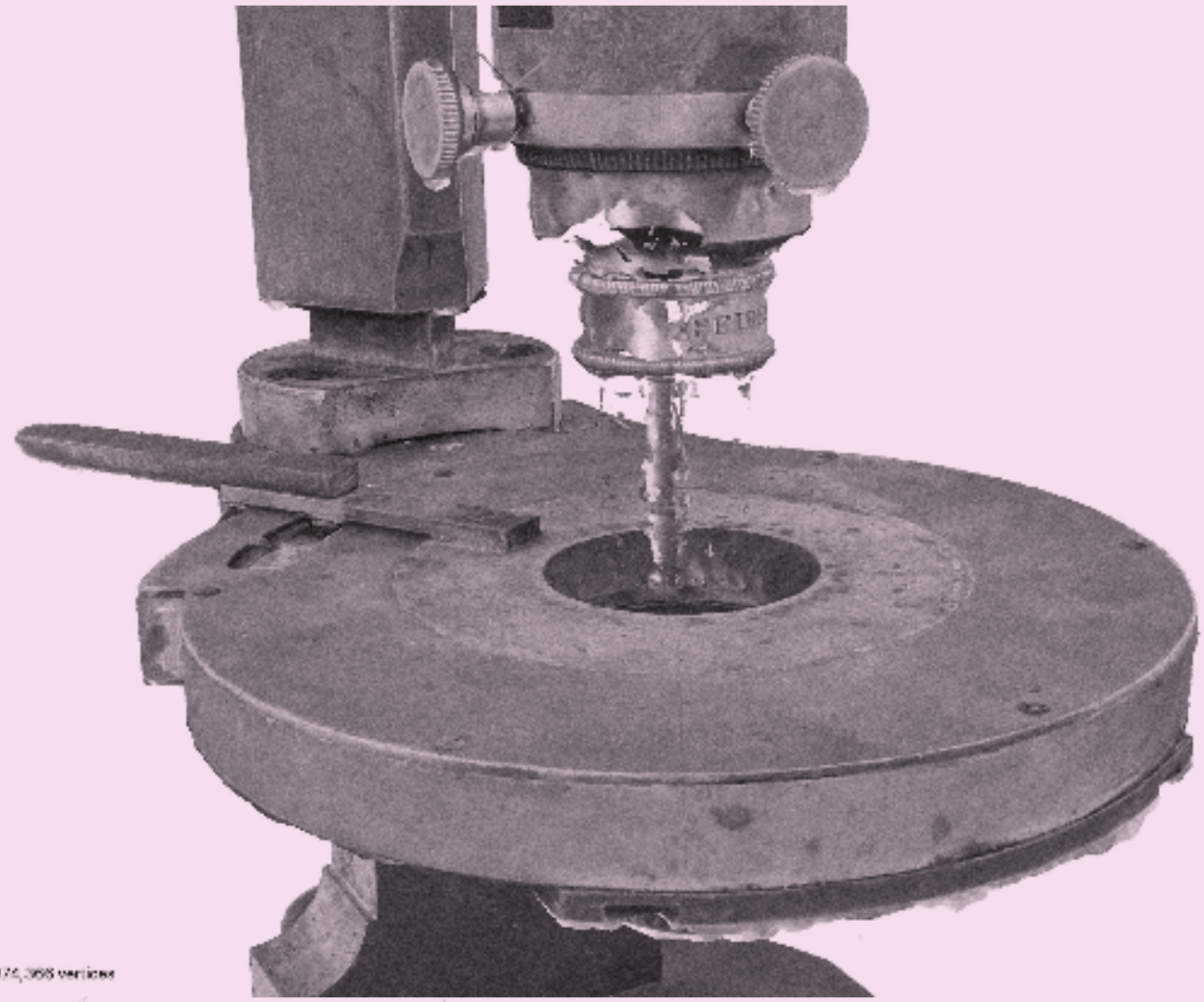


3D-Scans, 2025

024 Polarizing Microscope from Liquid Crystal Research ca. 1890



→ p.216





3D-Scans, 2025

Ammonia Synthesis Reactor 1923

→ p.242



200 Years KIT 100 Objects

Parts of a Whole

Selected Objects from KIT's History

Edited
by Klaus Nippert

KIT Scientific Publishing

Contents

3d-Scans, 2025 1

Foreword Jan S. Hesthaven 23

Foreword Helmuth Trischler 25

Foreword Alistair Hudson 27

Introduction 31

001 Portrait of Gustav Friedrich Wucherer 33

002 Theodolite 34

003 Sketchbook by an Architect 35

004 Founding Charter of Karlsruhe Polytechnical College 36

005 First Printed Program of Courses at the Polytechnical College 39

006 Signpost to the Reactor Station 40

007 Forearm Prosthesis 41

008 Research Reactor FR 2 42

009 KIT Logo 45

010 Spherical Section Model 46

011 Periodic Table of the Elements 48

Stages in KIT’s History 51

012 Herbarium of Alexander Braun 65

013 “Kneipbild” 67

014 School-Leaving Certificate 68

015 File on a Strike by Polytechnicians in 1848 69

016 Matriculation Roster of Karlsruhe Polytechnical College 70

017 Painting “Hohentwiel bei Singen” 72

018 Model for Teaching Mechanical Engineering 73

019 Transcript of a Mechanical Engineering Lecture by Ferdinand Redtenbacher 74

020 Mathematical Thread Model 76

021 Lantern Slide from Bruno Meyer’s Publishing House 78

022 Research into Electromagnetic Waves by Heinrich Hertz 79

Stages in KIT’s History (Continuation) 81

023 Drawing Exercises by a Civil Engineering Student 97

024 Polarizing Microscope from Liquid Crystal Research 98

025 Big Book of Doctorates Awarded by Karlsruhe Polytechnic 100

026 Chain of Office for the Rector of Karlsruhe Polytechnic 101

027 Memorial Plaque on the Bestowal of the Epithet “Fridericiana” on Karlsruhe Polytechnic 102

028 Photographic Portrait of Magdalena Neff 103

029 Certificate of Honorary Membership for Gas Chemist Hans Bunte 104

030 Professorial Robe at Karlsruhe Polytechnic 105

031 Beer Stein 106

032 Calculation Table for Anti-Aircraft Fire 107

033 Fritz Haber as a Gas Warrior 109

034 Doctoral Certificate of Irene Rosenberg 110

035 Emergency Money Vouchers for On-campus Living 111

036 Ammonia Synthesis Reactor 112

Stages in KIT's History (Continuation) 113

037 Voltmeter 129

038 Fractionating Column 130

039 Table Knife from the Refectory 131

040 Grandstand of the Sports Stadium 132

041 Sistrah Lamp 133

042 Design of a Thingstätte 134

043 Sign for the Oskar Stäbel House 135

044 Protest against the Removal of History Professor Franz Schnabel 136

045 Promotional Film for Engineering Studies 137

046 Racist Pamphlet on Heinrich Hertz 139

047 Personnel File on Professor Rudolf Weigel 141

048 Instrument for Measuring Carbon Dioxide Content in Room Air 143

Stages in KIT's History (Continuation) 145

049 Secret War Research 161

050 Reminiscences by Contemporaries about Studying under National Socialism 162

051 Dedicatory Sign by the 106th US Infantry Division for the Stadium of Karlsruhe Polytechnic 164

052 Tribunal Verdict 165

053 Travel Diary 166

054 Eiermann Table 169

055 Briefcase for Confidential Documents 171

056 Learning Matrix for Automatic Character Recognition 173

057 Core Memory 175

Stages in KIT's History (Continuation) 177

References and Notes for the Introduction 178

Chapter 1 – Beginnings 185

Chapter 2 – The Polytechnical College (1825-1885) 190

058 Photo Album 193

059 Theater Poster 196

060 Karlsruhe Nuclide Chart 198

061 Karlsruhe Standard Brick 200

062 Radiation-Protection Slide Rule 202

063 Separating Nozzle for Uranium Enrichment 204

064 Canine Unit Pennant 206

065 Fish Knife 207

066 Breeder Duck 208

Chapter 3 – Karlsruhe Polytechnic up to World War I (1885-1914) 214

Chapter 4 – World War I and the Interwar Period (1914-1933) 224

067 Hydrogen Automobile 225

068 Tissue Dispenser Box 227

069 "Henry the Ant" with His Gearwheel 229

070 The Tension Triangle as a Bionic Stabilization Principle 230

071 Trainer for Minimally Invasive Surgery 232

072 Superconducting Magnetic Coil for Nuclear Fusion 234

073 MIPAS Spectrometer 236

074 Karlsruhe Student Uprising 237

075 Self-Launching Glider 238

076 First German Computer Science Diploma 240

Chapter 5 – National Socialism and World War II (1933–1945) 247

Chapter 6 – Karlsruhe Polytechnic in the Postwar Period (1945–1967) 254

077 Noose 257

078 First Email Received in Germany According to the Internet Protocol 258

079 Student Periodical “Schärfer bitte!” 260

080 O-Phase T-Shirt 261

081 Grave Cross 262

082 Humanoid Robot 263

083 Arrangement of International Visitors’ Gifts 264

084 Drinking Cup of a Traveling Researcher 266

085 Precision Balance for the Lightest Elementary Particles 268

086 The KIT Backpack 270

087 High-Performance Computing Center 271

088 Big Tam-Tam 272

Chapter 7 – The Nuclear Research Center and Karlsruhe Research Center (1956–2009) 277

Chapter 8 – Karlsruhe University (1967–2009) 287

089 Mold for Radioactive Waste 289

090 Climate-Friendly Cement 291

091 Monument to the Fallen Polytechnicians in the Franco-Prussian War of 1870/71 292

092 Polytechnicians’ Pageant 293

093 Pallas Athena 296

094 Plaque in Memory of Gas Chemist Hans Bunte 297

095 Memorial Plaque on the Development of Ammonia Synthesis 298

096 Plaque in Protest of Chemical Weapons 300

097 Plaque on Research Reactor FR 2 301

098 Carl Benz Monument 302

099 Memorial Plaque Dedicated to the Victims of National Socialism 303

100 Student Flyer 304

Chapter 9 – KIT (2009–2025) 309

Chapter 10 – Addressing the Institution’s History 315

Notes for the Object Texts 322

Sources 324

Image Index 325

Acknowledgments 331

Biographies 335

Imprint 336

3d-Scans, 2025 337

Prof. Dr.
Jan S. Hesthaven,
President of KIT

Foreword

In 2025 KIT, the Karlsruhe Institute of Technology, celebrates its 200th birthday. Innovation is a tradition here. The forerunner establishments were already notable for their pioneering spirit, and at the founding of KIT the central idea was: to create a location that is not just modern but ahead of its time. Since 1825, standards are repeatedly being set in research, teaching, and transfer.

As a scientific and educational institution with a focus on the technical sciences, we have the future in view *per se*: We develop solutions to the most urgent challenges of our time and prepare future generations for responsible tasks in science and society. But what would the future be without the past? A glance backwards shows what must be kept, what should be discarded, what must be developed further or reconsidered. It helps bring new perspectives and makes path-breaking ideas possible in the first place. Community and identity are rooted in the past; the fertile grounds of resilience and creativity are there as well. That is why remembrance is of indispensable value to us all and — as the bicentennial exhibition of KIT and the 100 objects selected for it show — is quite a special and fascinating pleasure.

Throughout two centuries, students, researchers, teachers, and coworkers as well as numerous sponsors with amicable bonds to KIT in science, politics, the economy, and society, have made KIT what it is today: a place in the middle of society. In their memories, experiences, and insights, the history of KIT comes alive. I am pleased that with this exhibition our image of the institution can be enriched by personal stories and glimpses behind the scenes at KIT. Many members of the KIT family and persons around them have responded to the “call for objects” and gathered a large treasure trove of objects and stories which not only document the emergence and evolution of this place but also reflect studying, working, and living at KIT from its beginnings to the present day.

Nationally just as internationally, it is significant that KIT has always been solidly anchored in the City of Karlsruhe and the region, also as a site of many public events. What about KIT is important to you as visitors? What picture, what object occurs to you when you think of KIT?

My personal object would be — I’m a passionate builder of model ships — a model of “Endurance,” a racing boat classic from the 1930s. Some people compare KIT to a large tanker that is ponderous and sluggish, but I see it differently. To me KIT is like this sailboat: pretty, elegant, agile, and sustainable — a successful interplay of tradition and innovation.

Prof. Dr.
Helmuth Trischler,
Senior Researcher at
Deutsches Museum in Munich

Foreword

A catalog is the royal product attendant to a display of research communicated in museums and exhibition halls. It usually documents the presented objects in essays from among the curators as well as from external experts; it places them within professional and social contexts, and explains the underlying conception of the exhibition. In this way, the catalog assures that the results of the attendant research be saved beyond the temporal confines of the exhibition itself.

These goals also apply to the present catalog for KIT's bicentennial exhibition. And yet it diverges somewhat from the regular format of such a publication. This is due to the special character of the exhibition it documents and accompanies. Nowadays in the museum landscape there is much talk about participation; and the future of exhibitions is seen in co-creative formats in which the public is involved in various ways in the conceptualization and realization of an exhibition. The team of the Karlsruhe jubilee exhibition took this participative future for granted. A *call for objects* allowed the university public at large to join in on the planning of the exhibits. From among the abundant proposals received, the team selected in consultation with the exhibition advisory board a considerable proportion of the 100 objects, whose total was prescribed by the success model set by the former director of the British Museum, Neil MacGregor. This selection should not only present the eight epochs in KIT's history, from the founding of the *Polytechnische Schule* in 1825 up to the present day, in a somewhat equally balanced manner, but it should also encompass the variety of fields of activity and dimensions of work conducted at KIT as an increasingly specialized institution deeply anchored in society.

Participation is also a key concept for securing the future of universities in democratic, knowledge-based societies. Complementary to interdisciplinarity, which at KIT is already realized to a high degree, there is an urgent need for transdisciplinary openness through participatory and co-creative formats and for instruments of production and applications of scientific knowledge. This jubilee exhibition and its companion catalog have laudably shown from this retrospective on KIT's development spanning two centuries, yet with an eye to the present, how to make greater openness at universities succeed for a knowledge society fit for the future.

The advisory board has followed the exhibition team with great interest and equal engagement throughout its quite complicated genesis with multiple conceptual changes. As a result, an exhibition and a catalog have emerged that

offer stimuli for critical self-reflection on the situation of KIT on its way into a third century. The board hopes that the exhibition and catalog will find the attention it deserves.

Alistair Hudson,
Scientific-Artistic
Chairman of ZKM|Karlsruhe

Foreword

The ZKM | Center for Art and Media Karlsruhe is honored to be the host of the exhibition and collaborator in the accompanying publication, which celebrates the bicentenary of the KIT and tells the story of this important institution in 100 objects.

It is most fitting that ZKM partners this project, as our foundations and mission are also rooted in this history. More than this, it is fair to say that our cultural infrastructure in the Western World grew out the technical Institutes that were established in the early 19th century. These Institutes, in Europe, North America and Australia, were rapid responses to the pressing need to educate a population in the emerging technologies of the industrial age, and also to advance knowledge of the humanities and sciences together, in order to develop and manage the political economy with equity.

In the Anglophone world these centers were known as mechanics Institutes, that is, “institutes of the hand”; places of making and doing in contrast to the universities of the pre-industrial world. In these new centers, the Arts and Sciences were taught in combination to ensure a creative workforce that would be able to design and innovate, and be in control of the machinery at hand. This seems all the more pertinent now as we continue to balance rapid technological developments with ecological and human needs. It is no coincidence that these institutes, that gathered people together around accessible knowledge, also became the breeding grounds for modern democracy and the social movements we now take for granted.

In more specific terms, we could say that the ZKM is itself an “object” that has come partly out of the KIT. The idea of a “Center for Art and Media Technology” was launched on May 7, 1985, at a meeting of the Cultural Committee of the City of Karlsruhe in the Senate Hall of the University of Karlsruhe, as this part of the later KIT was known at that time. There were many people from different faculties, scientists and engineers with an enthusiasm for art, who all helped to give birth to the ZKM, people who saw the need for a place for art and artistic and academic research in the new media, as a citizens’ forum, and a public space for mediation and education. These include Prof. Dr. Peter Deussen, Prof. Dr. Rolf Funck, Prof. Dr. Hellmut Wagner and Dr. Michael Heck to name a handful. It warms my heart that the latter still maintains an office at ZKM today. This colloquium of forward-thinking minds took inspiration from the interdisciplinary Center for Advanced Visual Studies (CAVS) at the Massachu-

setts Institute of Technology (MIT) in Cambridge, USA, bearing in mind that MIT itself took inspiration from the European Polytechnic University model then coined and still today epitomized by KIT.

Such loops, eddies and connections in history have continued to this day in the form of research, exhibitions, experiments, artistic commissions, publications, lectures, symposia, music and performance. Highlights include the project *Molecular Aesthetics* (2013), the exhibitions *Open Codes* (2017–19) and *BioMedia* (2021–22) as well as the recent exhibition and publication project *Choose Your Filter* (2025). But it is also the day-to-day traffic of ideas and concepts between KIT and ZKM that drives our work, and that builds to become larger projects mutually developed together. This is the success of the open system that has been created and that opens the door to future innovation.

Personally, I am very grateful for the input of Prof. Dr. Thomas Hirth, KIT's Vice President Transfer and International Affairs, who chairs ZKM's Advisory Board and leads the most symbiotic and congenial of relationships between these two great institutions of the city of Karlsruhe. Long may it continue.

Colligite quae superaverunt fragmenta, ne pereant.
(Gather up the fragments that remain, that nothing be lost.)

St. John 6:12

Dr. Klaus Nippert

Introduction

This volume is designed to be leafed through. You can look at the illustrations and let your curiosity be your guide in discovering their stories at KIT. You can find out more details, if you like, about some of the displayed objects in supplementary commentaries. Browsing, ambling about, and occasional lingering is welcome. There are many other benefits to gain besides the intended entertainment value, including insights into the history and therefore the identity of KIT and its predecessor institutions.

In 2009, the Karlsruhe Institute of Technology appeared on the scene with the three letters K I T, which are also in its logo. As a merger of a major national research center supported by the Federal Republic of Germany and the state of Baden-Württemberg with a technical university, KIT was and still is unique in the German scientific landscape. With the founding of KIT, two predecessor institutions disappeared: Karlsruhe Research Center, founded in 1956 and known for a long time as the Nuclear Research Center (*Kernforschungszentrum*); and Karlsruhe Polytechnic (*Technische Hochschule*), founded in 1825 as Karlsruhe Polytechnical College (*Polytechnische Schule*).

The idea of presenting KIT's history in an exhibition on the occasion of an anniversary was born at the KIT Archives after the German translation of *A History of the World in 100 Objects* by British art historian Neil MacGregor was published in 2011.[1] In the lead-up to KIT's bicentennial celebrations in 2025, Neil MacGregor's successful concept was applied to many related publications. Despite the increasing popularity of this chosen format, the plan to offer a history of KIT in this manner was retained. This approach is particularly fitting given the state of research into the history of KIT and its antecedents, which has been comparatively limited to date. While brief overviews and detailed studies exist, comprehensive research on the institute's history is still lacking. Nevertheless, a body of knowledge has been established, largely thanks to the work of the Karlsruhe University Archives (as of 1985) and, from 2009 onwards, the KIT Archives, which are responsible for the acquisition and inventorying of archival material. These tasks, along with the handling of research questions posed by users, have yielded insights into various contexts that could themselves form the basis of lectures and publications. Given the core business of an archive, the time needed to communicate and document much of this knowledge is not available. Rather than condense research findings into a single comprehensive narrative, we present

individual parts, each of which are instructive on their own and offer some insight into the history of the institution.

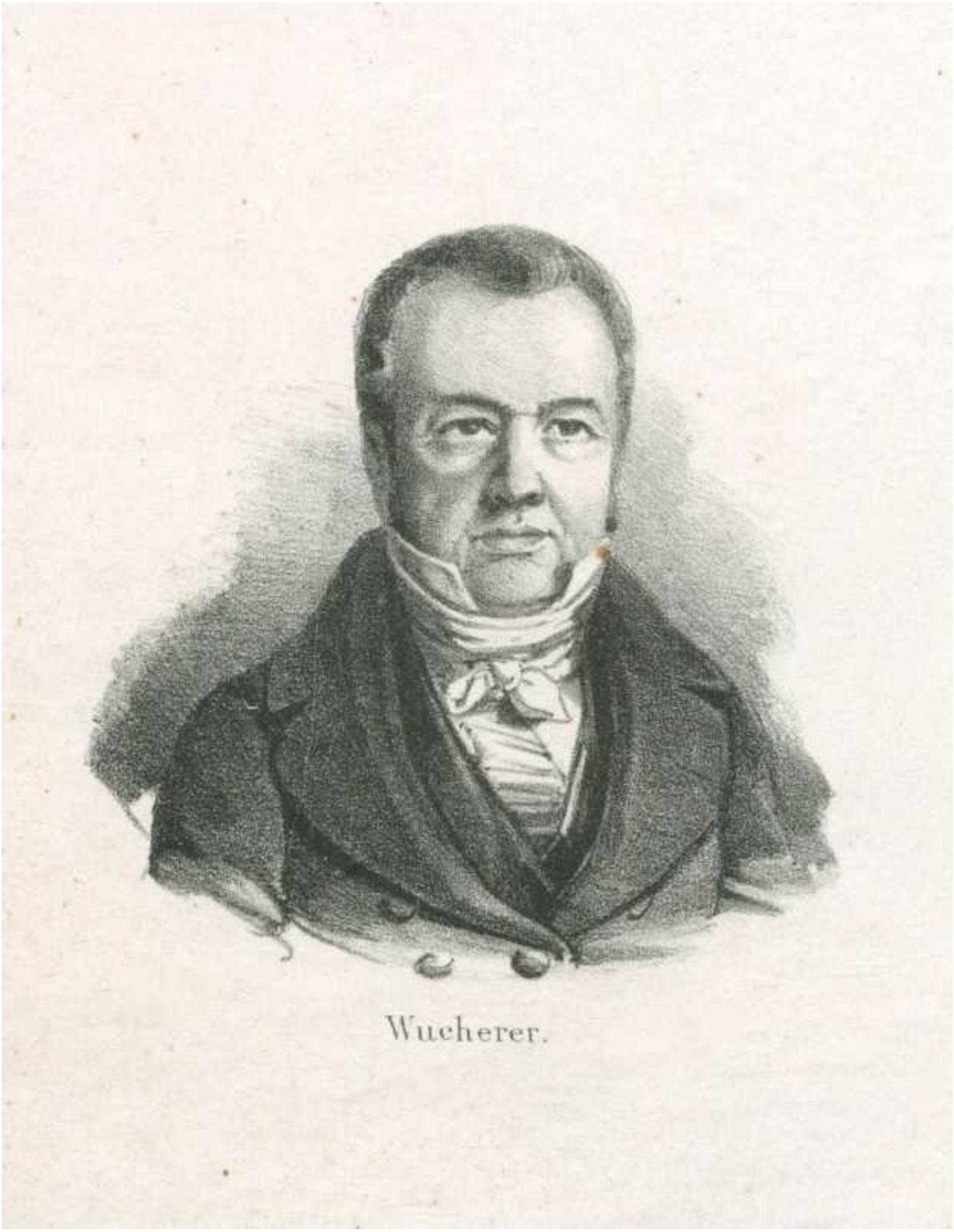
Another reason for choosing the 100–object format is the collection in the repositories of the KIT Archives. Alongside archival records of research, teaching, and administration, we find scientific equipment, teaching models, works of art, everyday items, and even objects of anecdotal significance. While some of these objects already brought along their own unique stories, others are interesting as subjects of study.

By focusing on individual objects and their contextualizations in short texts, the 100–objects format offered a suitable means to communicate fragmentary knowledge. This succinct form of presentation can make clear how and in which contexts research and teaching have been carried out since the beginnings of Karlsruhe's technical college, *Polytechnische Schule Karlsruhe* in 1825. Its methods and ties extending beyond the academic world are at least as interesting today — sometimes even more so — than specific details about outdated science.

However, the KIT Archives served only as the point of departure for the exhibition of 100 selected objects. A call for objects was the cornerstone of this project, inviting KIT members and individuals from its wider community to propose items they deemed suitable for illustrating the institution's rich history. This initial phase, commencing in 2021, was spearheaded by university history expert Anton F. Guhl. Collaborating with a dedicated team comprising Luna Labenz, Magdalena Pfeiffer, Patricia Schillinger, Martin Benjamin Ullman, and Anja Weindel, Guhl released the call for objects, meticulously researched the incoming proposals, and curated an initial selection for presentation. In 2023, the task transitioned from Anton F. Guhl to Andrea Stengel, an art historian and exhibition expert. Under Stengel's guidance, the selection of objects was refined and adjusted to suit the conditions of an exhibition. This involved meeting the dual objective of making everything digitally accessible to permit remote engagement, while also presenting a significantly smaller selection in physical form. The decision to make a primarily digital presentation expanded the scope in selecting the objects. Some two-dimensional or indeed immaterial telling relics of KIT's history could thus be selected which otherwise could hardly have found their way into an exhibition of exclusively concrete items.

001 Portrait of Gustav Friedrich Wucherer early 19th c.

→ p.185
↳ 004



002 Theodolite ca. 1820

→ p.185
↳ 058

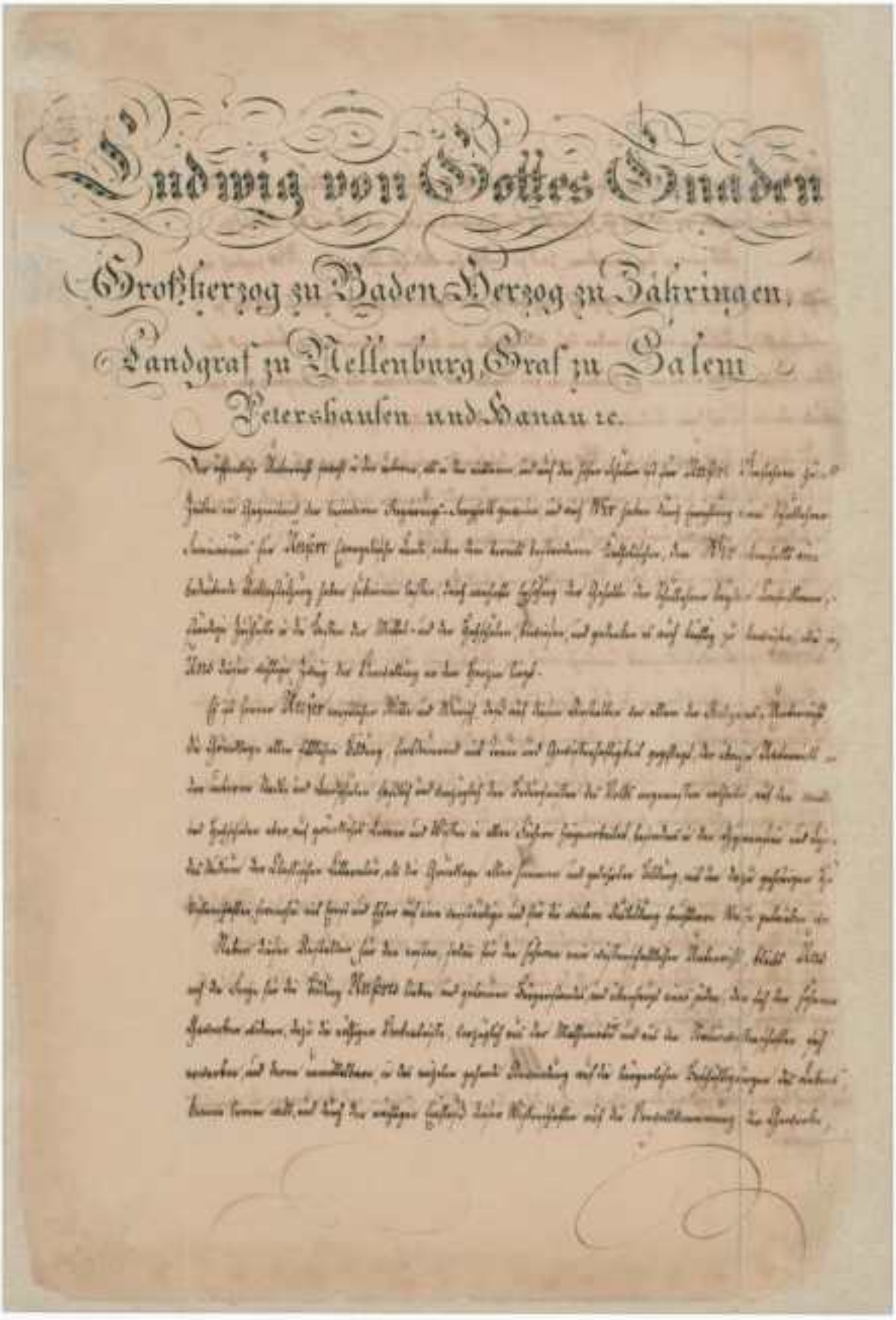


003 Sketchbook by an Architect ca. 1824

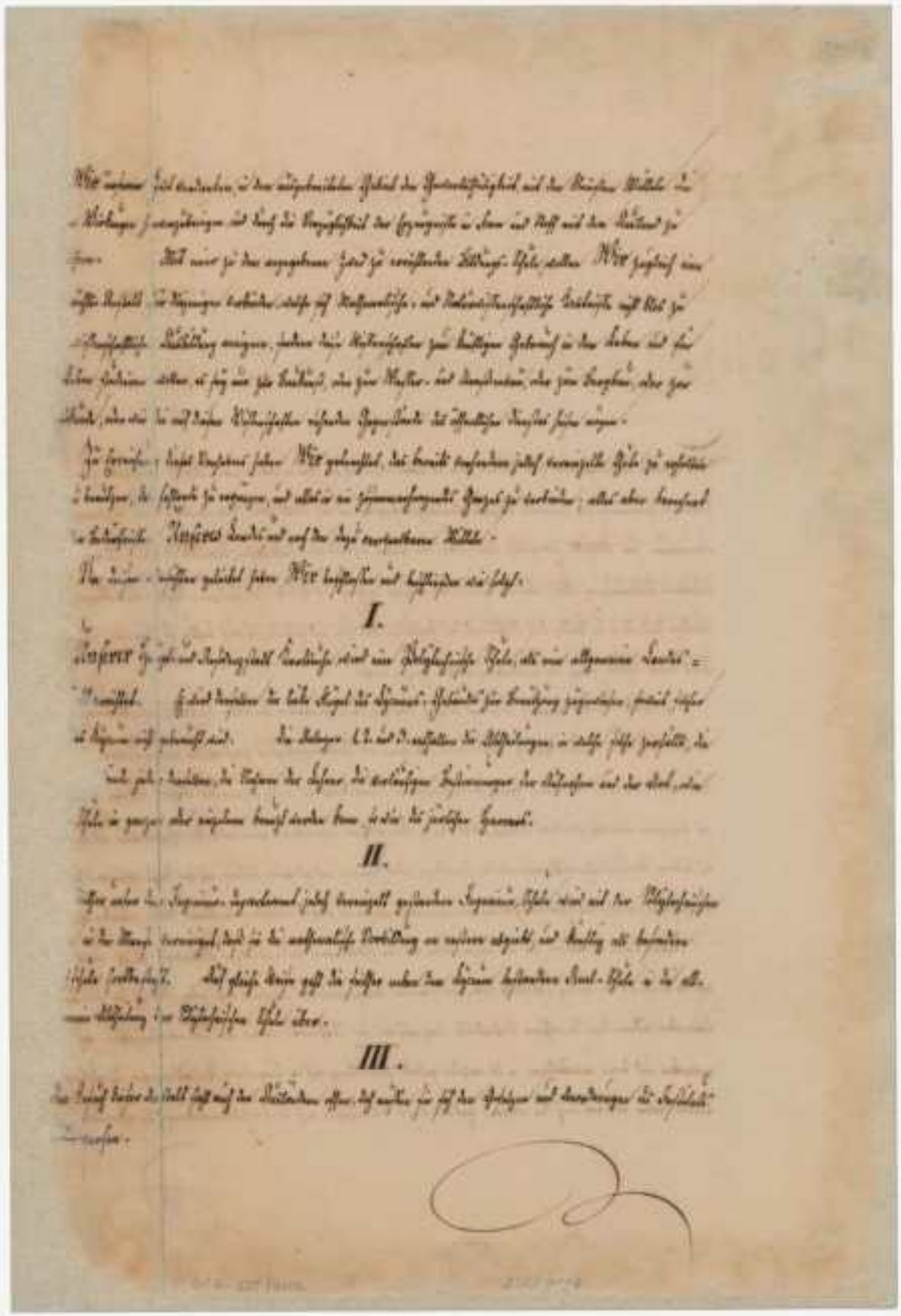
→ p.186



004 Founding Charter of Karlsruhe Polytechnical College 1825

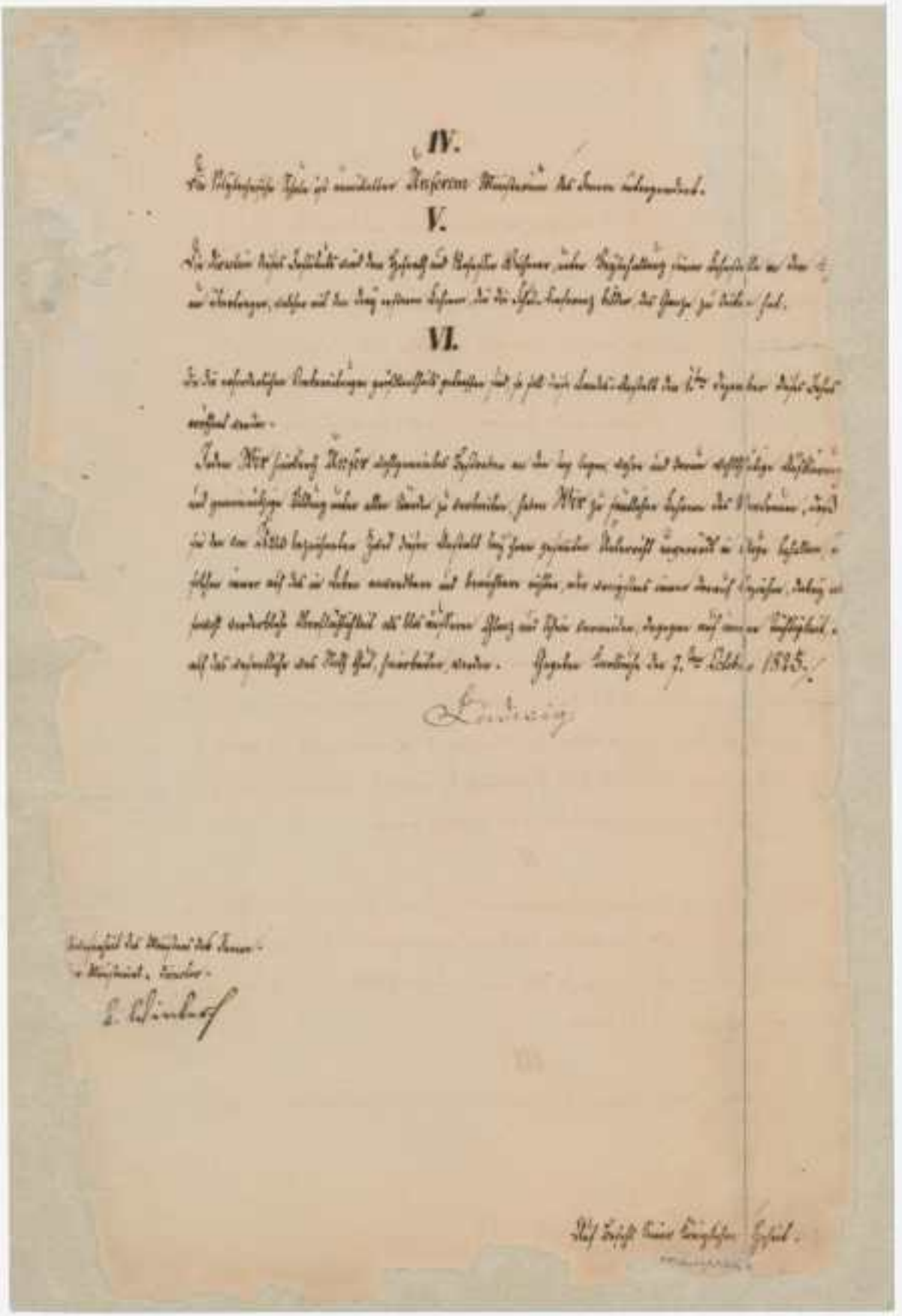

Ludwig von Gottes Gnaden
Großherzog zu Baden, Herzog zu Zähringen,
Landgraf zu Nellenburg, Graf zu Salem
Petershausen und Hanau ꝛc.

→ p.186
↩ 001



Founding Charter of Karlsruhe Polytechnical College 1825

→ p.186
↩ 001



IV.

§ 4. Die Polytechnische Schule ist unmittelbar Unserem Ministerium des Innern untergeordnet.

V.

§ 5. Die Direction dieser Lehranstalt und das Lehramt der Mathematischen Wissenschaften, sowie die Vorbereitung eines Lehrplans für diese Anstalt, sollen mit der Weisung unseres Ministeriums des Innern Unserer Hofrath Professor Hoffmann besorgen.

VI.

§ 6. Die näheren Bestimmungen hinsichtlich der Lehrgegenstände, der Lehrart, der Lehrmittel, der Disciplin, der Prüfungen, der Ferien, der Aufnahme der Schüler, der Ertheilung von Zeugnissen, der Stipendien, und der Schulgelder, sollen Unserem Ministerium des Innern vorbehalten bleiben.

Unser Ministerium des Innern ist beauftragt, Unsere Verordnung, welche durch Unser Regierungsblatt bekannt gemacht werden soll, zu vollziehen.

Gegeben Carlsruhe den 7ten October 1825.

Ludwig.

Vorstehendes ist Wortlaut des Gesetzes, welches Seine Königliche Hoheit der Großherzog Ludwig Allergnädigst Sanctionirt haben.

Carlsruhe, den 7ten October 1825.

L. Winter.

Für Gleichheit der Abschrift mit der Urschrift.

Carlsruhe, den 7ten October 1825.

L. Winter.



Programm

der

Großherzoglich Badischen

Polytechnischen Schule

zu

Karlsruhe

für

das Jahr 1832—33.

Der Unterricht beginnt am 5. November. Wegen verspäteter Erscheinung des Programms ist die Aufnahmszeit für dieses Jahr auf den ganzen November ausgedehnt.

IV. 0,1.

006 Signpost to the Reactor Station 1957 → p.187

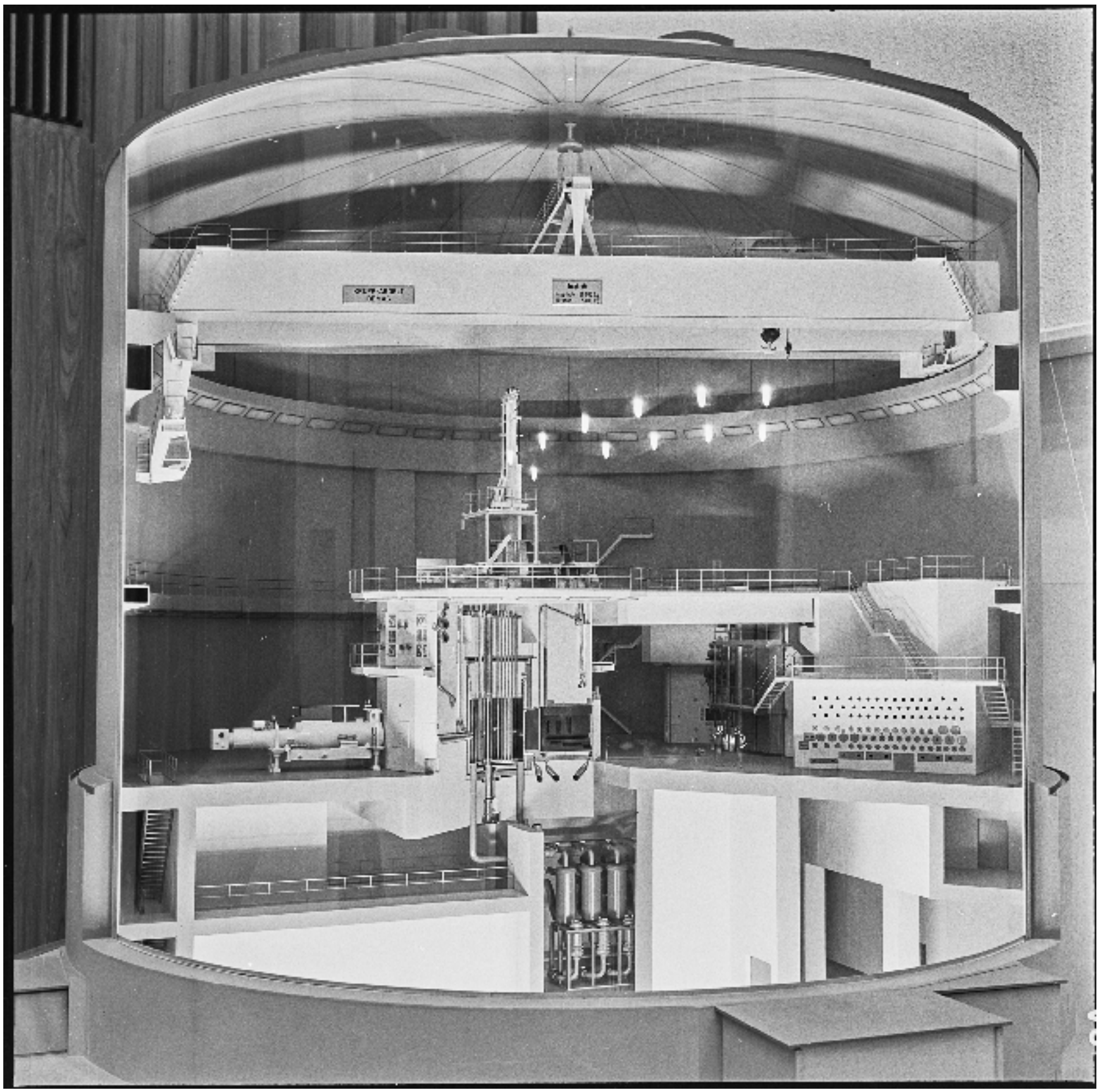


007 Forearm Prosthesis ca. 1945

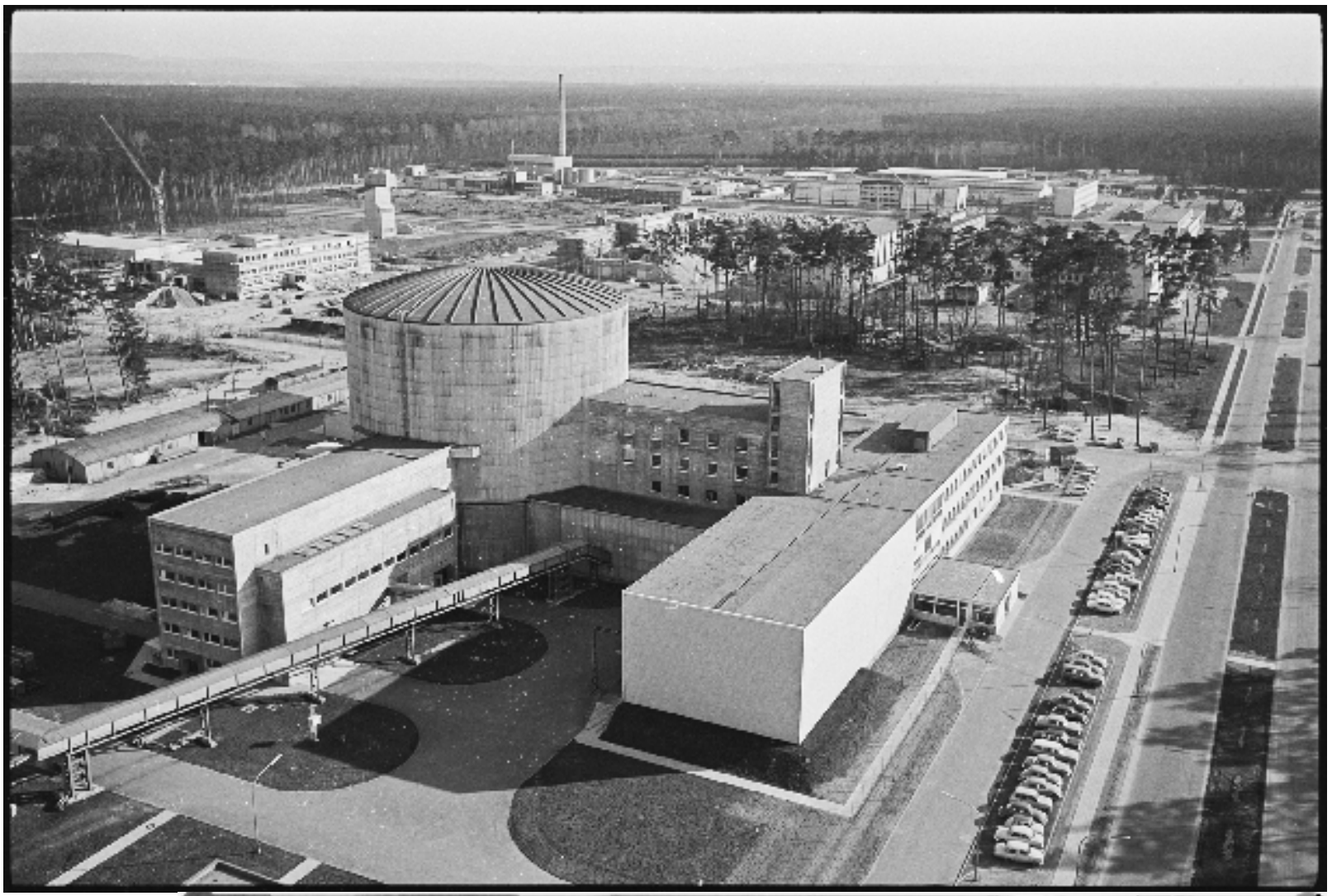
→ p.188
↳ 073

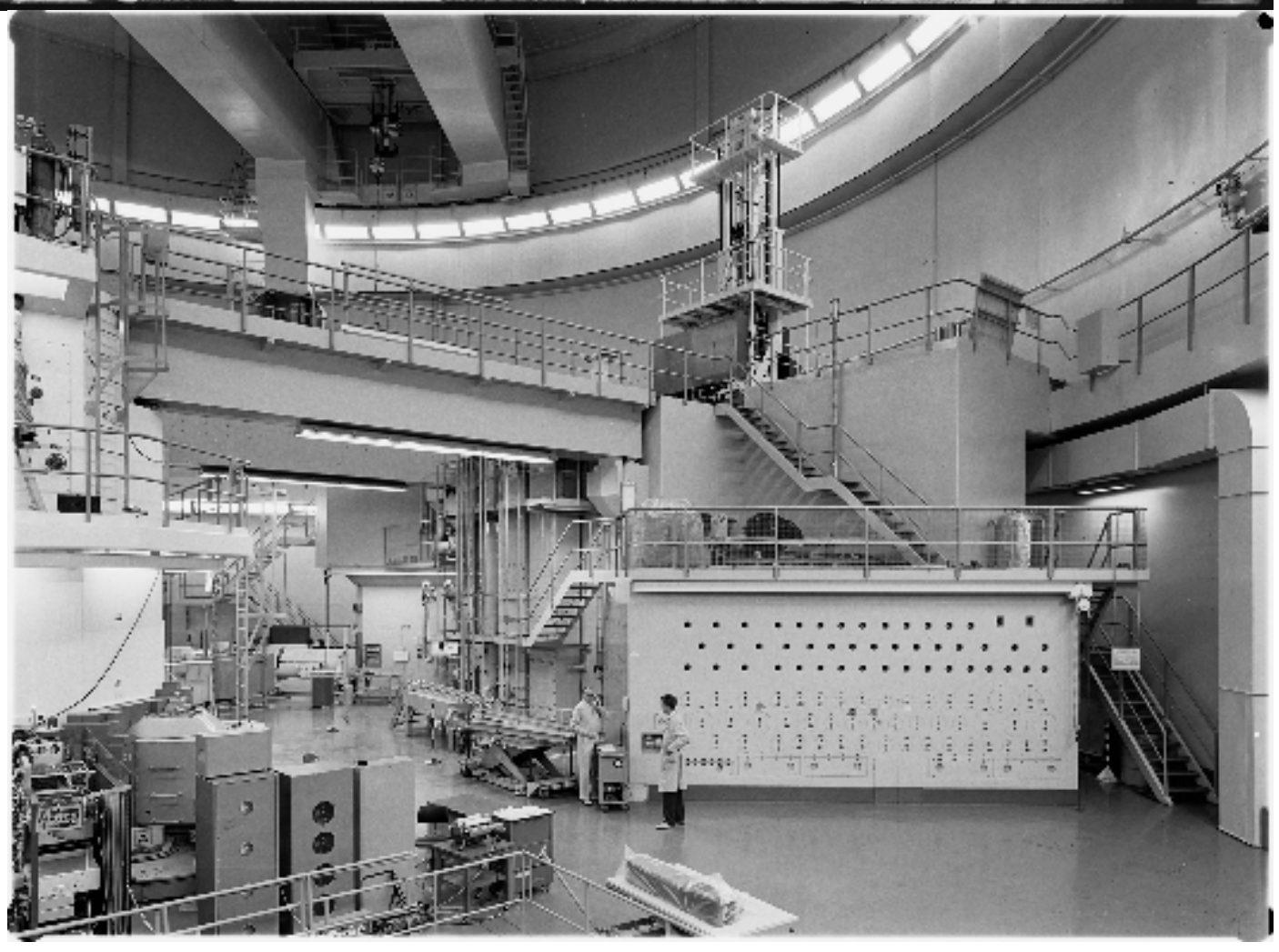


008 Research Reactor FR 2 1961



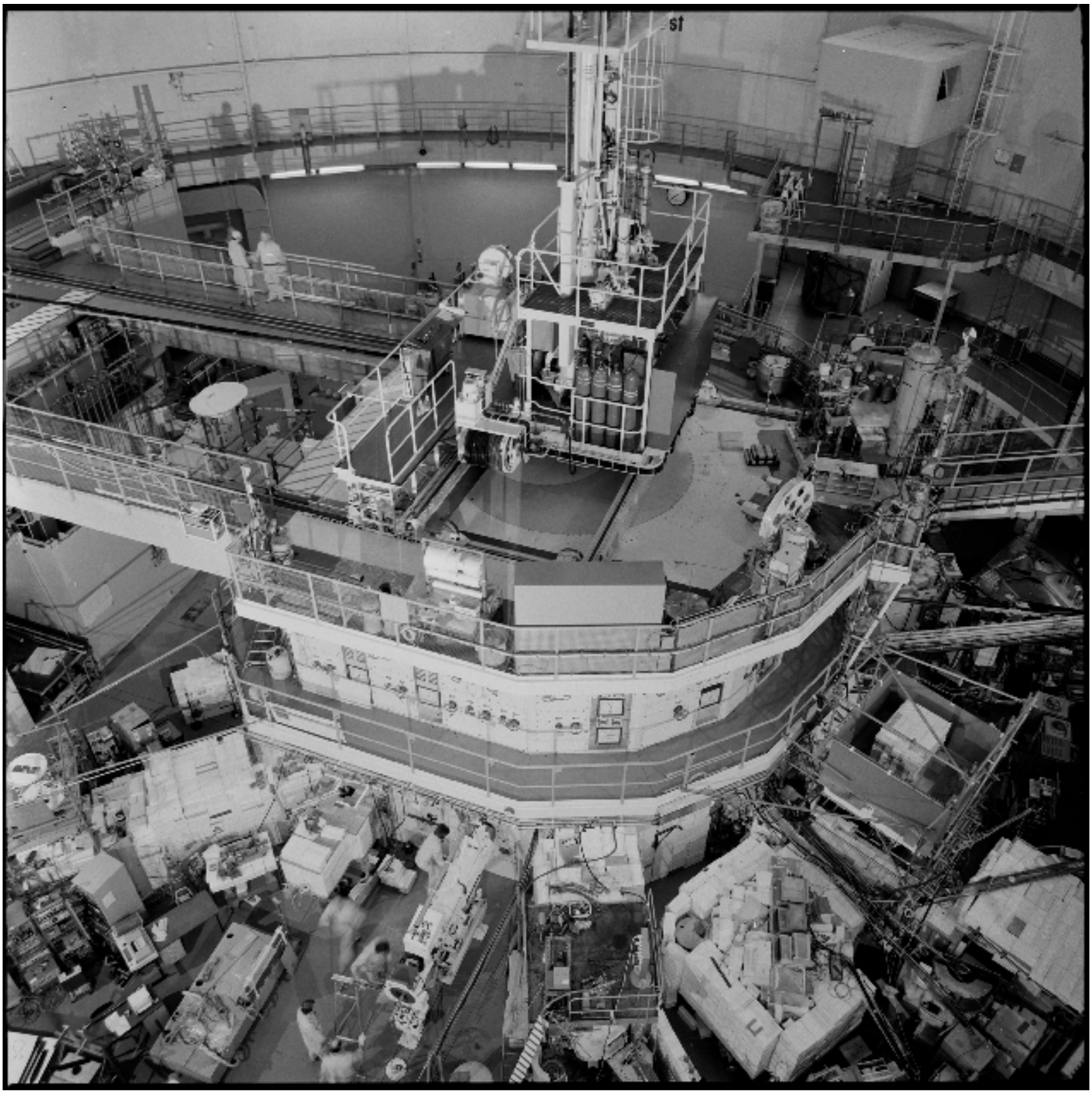
→ p.188
↳ 064; 066;
067; 072;
089; 097





008 Research Reactor FR 2 1961

→ p.188
↳ 064; 066;
067; 072;
089; 097



009 KIT Logo 2006

→ p.189
↳ 081



B = 1,5 x A

100 % Grün

1. CMYK
- 100 Cyan
- 0 Magenta
- 60 Yellow
- 0 Schwarz

2. Sonderfarbe
- Pantone 3278
- RAL 5018

3. RGB/Hexadezimal
- 0 R 150 G 130 B
- #009682

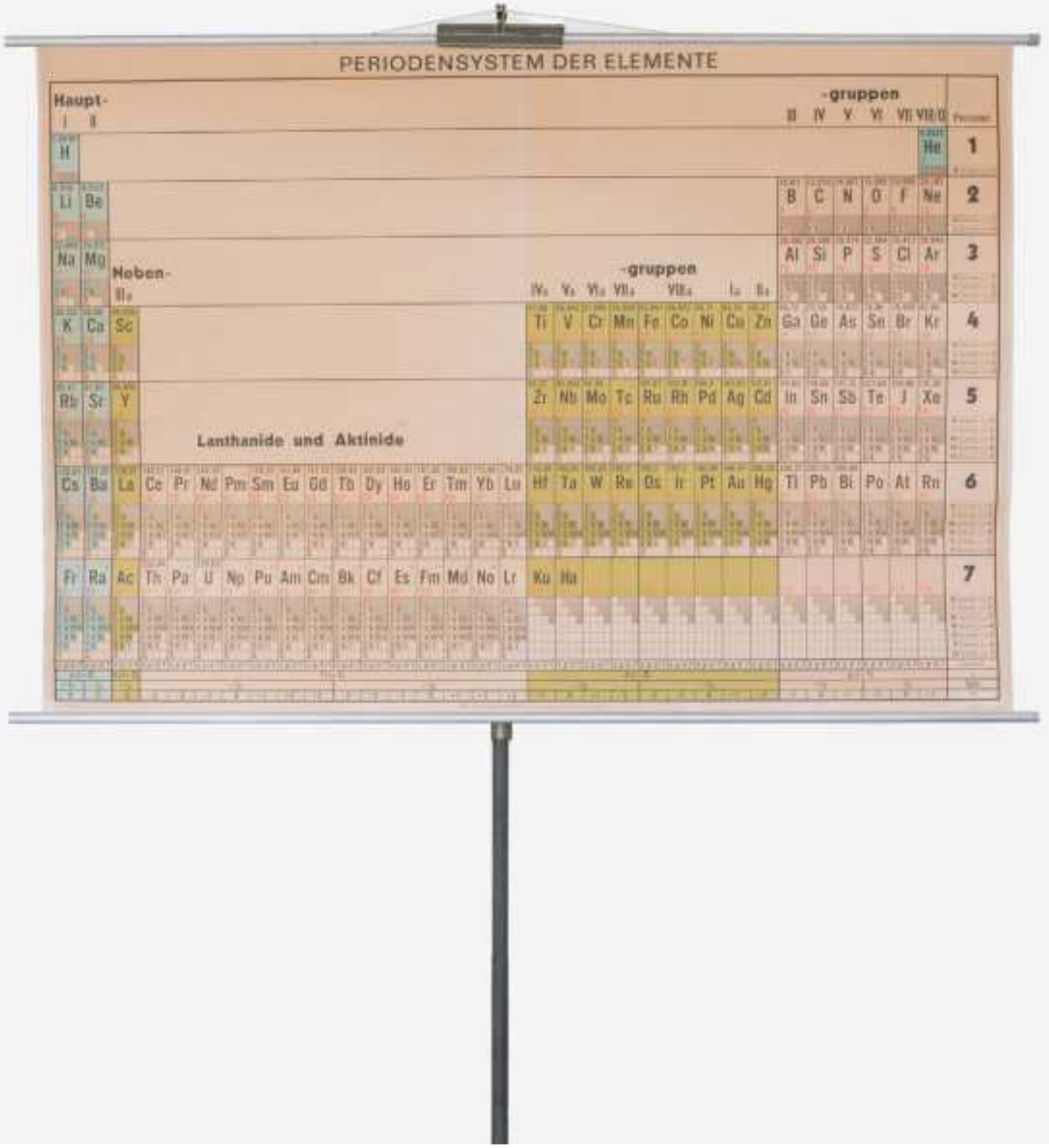
010 Spherical Section Model 1833



→ p.190
↳ 018; 020



→ p.190
↳ 029; 036; 038



The exhibition *KIT, 200 Years – 100 Objects – Parts of a Whole* is projected to be accessible on line until 2030 at the Internet address https://100objekte.kit.edu. The objects selected for physical presentation will be on display from April 12 to October 19, 2025 at the ZKM | Center for Art and Media Karlsruhe.

This accompanying volume to the exhibition starts by tracing the stages in the history of KIT. This outline contains notable points in the development of the institution and important events. Most of the displayed objects are referred to by number in the text, so they can also be regarded as a series of illustrations of the historical account. This arrangement may cause some aspects to appear more than once. However, this volume is designed rather to draw connections, with the introductory overview in mind, whereas the individual articles offer more in-depth descriptions of the objects themselves. Like the exhibits, this narrative is divided into ten chapters:

1 Beginnings
2 Karlsruhe Polytechnical College (1825–1885)
3 Karlsruhe Polytechnic up to World War I (1885–1914)
4 World War I and the Interwar Period (1914–1933)
5 National Socialism and World War II (1933–1945)
6 Karlsruhe Polytechnic in the Postwar Period (1945–1967)
7 Nuclear Research Center and Karlsruhe Research Center (1956–2009)
8 Karlsruhe University (1967–2009)
9 KIT (2009–2025)
10 Addressing the Institution's History

Sandwiched between the chapter focusing on objects from the founding phase of KIT and its predecessor institutions, and the chapter on the institution's self-perception in history, chapters 2 to 9 are arranged in chronological order. This structure was specifically designed to convey the evolutionary steps leading up to the founding of KIT.

Königsbach, in February 2025

Klaus Nippert

Stages in KIT's History

People trying to understand what KIT is, often compare it to a conventional university. While this approach can be illuminating, it requires an open mind to appreciate the unique aspects of KIT's structure. Focusing solely on the classical university model can give rise to a perspective limited "only" to what KIT does do, or what it "isn't" rather than what it uniquely is.

> "I've studied now Philosophy
> And Jurisprudence, Medicine, —
> And even, alas! Theology, —
> From end to end, with labor keen;
> And here, poor fool! with all my lore
> I stand, no wiser than before:" [2]

Doctor Faust from Goethe's play of the same name lists the elements of a university since the Middle Ages until the late eighteenth century when the work was written — the liberal arts faculties, often specifically referred to as philosophy, law, medicine, and theology. A comparison of Karlsruhe Polytechnical College and also its successor, the *Technische Hochschule* — Karlsruhe Polytechnic — against this classical model of a university reveals what this institution neither aspired to achieve nor ever became. By 1895, Karlsruhe Polytechnic had developed a structure divided into departments. While these departments were not yet officially called *Fakultäten*, or "faculties," they largely functioned as such:

> »1. General Department (for mathematics and general education subjects),
> 2. Department of Architecture,
> 3. Department of Engineering,
> 4. Department of Mechanical Engineering,
> 5. Department of Electrical Engineering,
> 6. Department of Chemistry (including Pharmacy),
> 7. Department of Forestry." [3]

The General Department roughly corresponds to philosophy or the liberal arts. But law, medicine, and theology are not represented at the departmental level at all. Instead, we see departments of engineering (focusing on roads, bridges, railroad facilities, and hydraulic engineering — now known as civil engineering), architecture, chemistry, mechanical engineering, electrical engineering, and forestry. This disparity shows that merely noting the absence of classical depart-

ments would be inadequate. To understand the character of advanced German polytechnics, we must explore how their alternative canon of subjects and independent identity from other types of universities developed. The historical evolution outlined here primarily focuses on the developmental stages leading to a technical university.

The classical university model is insufficient to fully capture what defines a technical university. Similarly, it would be overly simplistic to interpret the history of KIT as merely a progression from Karlsruhe Polytechnical College, founded in 1825, to the new type of higher academic institution, a *Technische Hochschule*, i.e., Karlsruhe Polytechnic, and ultimately to the integration of a national research center. The different functions of large-scale research and the duties of a university that KIT inherited from its predecessor institutions remain separate areas of special focus which have become essential characteristics of KIT and yet are not melded into a homogeneous entity.

The younger partner in the KIT merger, established in 1956 as Karlsruhe Nuclear Research Center (*Kernforschungszentrum Karlsruhe*), was an institution for large-scale non-university research. This new type of organization emerged during World War II, with the most notable example being the Los Alamos National Laboratory in New Mexico, established in 1943 to develop the first nuclear weapons. As part of the American war effort, resources were pooled on an unprecedented scale, allowing many scientists and support staff to work in a coordinated manner on a politically prescribed task outside a university setting. Based on the latest scientific findings, large-scale equipment was developed in-house, and work spanned the full range from basic research to application. These defining characteristics of the national laboratory influenced the organization and self-perception of Karlsruhe Nuclear Research Center. The professed aim was a very different one, however. The American national laboratory sought to fulfill purposes of war. The Nuclear Research Center, on the contrary, was founded with the explicit stipulation to pursue purposes of peace.

↩ 006

These brief remarks show that understanding what KIT, founded in 2009, represents requires examining the development of both its predecessor institutions. This overview can only present the development in broad strokes, with some details chosen for purposes of illustration rather than to achieve completeness or a balanced view. As regards more recent decades, research has not been conducted so far on this densely documented part of the institution's history to

provide a comprehensive picture with justifiable weightings beyond highlighting individual points or verbalizing statistics. Therefore, here the description of recent decades is limited to aspects important for a basic understanding of the antecedent institutions that now constitute KIT.

Karlsruhe Polytechnical College

Beginnings

On October 7, 1825, Grand Duke Ludwig of Baden and his government officials founded the *Polytechnische Schule Karlsruhe* with the aim of training technical specialists for both the civil service and the private sector. This new institution followed in the wake of the polytechnical institute founded in Prague in 1806 and the one established in Vienna in 1815. These early polytechnical colleges shared a common goal: to keep pace with the industrialization spreading from England by training skilled workers domestically, to reduce dependence on imports and foreign expertise. The founding of these polytechnical colleges represented investments in educational infrastructure, intended to benefit overall prosperity in their respective countries.

↩ 004

The Karlsruhe founding differed from the *École Polytechnique* in Paris, which had existed since 1794 and was often cited as a model. The French institution primarily served to train civil servants and was incorporated into the military soon after its foundation. [4] Additionally, the École initially focused on teaching fundamentals, leaving the instruction of applications of these principles to more advanced vocational schools. In this respect, the Karlsruhe founding occupied a middle ground between the Parisian model and the Viennese college. The latter combined preliminary education and specialist training in its curriculum. Karlsruhe Polytechnical College served partly as preparation for the engineering school set up and run by Johann Gottfried Tulla (1770–1827) within the Water and Road Construction Administration. [5] Other students attended the construction school run privately by Friedrich Weinbrenner (1766–1826), which initially was also described as part of the Polytechnical College. [6] It can also be assumed that some students took technical lessons without later attending one of these vocational schools.

↩ 001

From 1818 to 1822, Gustav Friedrich Wucherer, the founding director of Karlsruhe Polytechnical College, gathered his first experience with his privately run polytechnical

teaching curriculum in Freiburg. This program consisted of general education, mathematics, and scientific and technical subjects. [7] According to recent findings, students aged 11 to 21 were admitted to classes initially in the southern annex of Karlsruhe City Church on Marktplatz, sharing the space with the Lyceum and the Realschule. The regular admission age was between 13 and 14, about seven years younger than the typical age for entry into university. Sources record a total of 413 students in the Polytechnical College's first seven years of operation. [8]

The fact that most of the lecturers held the title of professor should not obscure the fact that the Polytechnical College did not begin as a university. In fact, the polytechnical college's position within the educational system of the Grand Duchy had not yet been systematically laid down. Nevertheless, the institution functioned entirely like a school, with classes, timetables, and grading decisions; and research was not yet among the official duties of the teaching staff.

Reform by Carl Friedrich Nebenius in 1832

The early years of Karlsruhe Polytechnical College were soon viewed critically, which perception persisted a long time among scholars. However, new studies on the student body in the early years have shown that the school was attractive to both the upper middle classes and the nobility. [9] This raises the question of whether the verdict by the Baden state councilor, Karl Friedrich Nebenius (1784–1857), that the polytechnical college had initially emerged as a "freak of nature" [10] had not also been motivated to a large extent by the reorganization he himself undertook in 1832. There was already sufficient external motivation for it, as the deaths of their two directors a few years earlier had put the futures of both Weinbrenner's School of Architecture and Tulla's School of Engineering onto the agenda. Nebenius demonstrated his energy by integrating both institutions into the Polytechnical College, adding the Forestry School previously located in Heidelberg and subdividing the henceforth greatly expanded Polytechnical College into Technical Schools. From the school year 1832/33, teaching at Karlsruhe Polytechnical College initially proceeded in two one-year courses known as mathematics classes, which offered education in basic subjects as well as mathematics. These basic courses were then followed by clearly segmented courses of study. These courses were organized into departments of the Polytechnical College known as Technical Schools.

There were initially:

- the “Building School,” primarily qualifying students in architecture and the advanced building trade;
- the “Engineering School,” focusing on the content of today’s civil engineering, enriched with mechanical engineering content;
- the “Higher Vocational School,” serving as a training center for manufacturers and leading industrial personnel, with a focus on chemistry and additional subjects in natural sciences, construction, and mechanical engineering;
- the “Forestry School”;
- and the “Commercial School.”

Except for the Commercial School, these Technical Schools offered courses of at least two years’ duration, with the emphasis roughly divided equally between basic and specialized instruction. From 1833, students had the opportunity to work practically in a mechanical workshop, where teaching aids were also produced. This workshop served as a transit station for polytechnical students such as Emil Kessler and Jakob Friedrich Messmer, who later embarked on careers in mechanical engineering. The curriculum of the Polytechnical College placed strong emphasis on drafting instruction, which was essential for both architects and engineers. These courses ranged from freehand to perspectival drawing, including extensive exercises in descriptive geometry, and extended into subjects related to specialized studies. The newly relocated forestry training at Karlsruhe Polytechnical College remained part of the overarching technical curriculum until shortly after World War I. But this branch originating from Heidelberg introduced an unintended side effect: an academic self-awareness began to shape the mentality among the students.

↩ 010

In the year following the reorganization, the Polytechnical College received an opportunity to construct its own property, thanks to a substantial private donation from the fashion entrepreneur Georg Stulz (1771–1832). From 1833 to 1836, the building on Kaiserstraße, long known as the main building, was erected according to the plans drafted by Heinrich Hübsch (1795–1863), the state senior building officer who taught architecture there. Initially, only the current west wing could be realized. Both wings of the building would have accommodated all the classrooms and the administrative offices, which were less extensive at the time. The restriction

to the west wing necessitated the usage of alternative space only temporarily. This applied to the workshop and a provisional chemical laboratory.

Chemistry and Mechanical Engineering as Focal Points

In 1841, two new teachers joined Karlsruhe Polytechnical College, which significantly changed the institution without any apparent structural plan being behind it. Ferdinand Redtenbacher (1809–1863), from the Upper Industrial School in Zurich, succeeded Wilhelm Ludwig Volz (1799–1855) as mechanical engineering instructor. While negotiating the details of his teaching position in Karlsruhe, Redtenbacher, then a teacher of applied mathematics in Zurich, emphasized the importance of developing mechanical engineering as an independent subject. /[11]

This initially included limiting his activities to mechanical engineering. Redtenbacher also requested teaching duties that allowed sufficient time for him to study the material and one might perhaps even say, to conduct academic research. He also secured the permission to build up a collection of demonstration materials. At first, he worked within the existing structure and curriculum to supply trainees for several Technical Schools, primarily the Engineering School, as well as the Higher Vocational School and the Building School.

↳ 018

The addition of the chemist Karl Weltzien (1813–1870) to the Karlsruhe Polytechnical College staff was completely different from Redtenbacher's, who had set several demanding conditions for his engagement. /[12] Weltzien had studied medicine in Heidelberg and Göttingen, earning his doctorate, then continued his training as a chemist at Berlin University before returning to Karlsruhe, where his parents lived. In 1841, after a trial lecture, Weltzien received permission from the Baden Ministry of the Interior to teach chemistry at both the Polytechnical College and the Karlsruhe Lyceum. This was a self-initiated appointment. Weltzien, who came from a wealthy background, received no fixed salary but did collect lecture fees from attending students; some of these classes were held in his private home. The way that Weltzien was appointed private lecturer also highlights the state of the Polytechnical College's organization. The teaching staff at a specialized department did not yet have the right to confer a habilitation degree at that time. Weltzien worked alongside Mining Councilor Friedrich August Walchner (1799–1865), the professor of chemistry, geology, and mineralogy. Weltzien supplemented organic chemistry, which

dealt with carbon compounds. This emerging field of study made important contributions to augmenting agricultural yields and to the chemical industry, particularly in dye production. Weltzien's lectures in this new field attracted so many students that Walchner was left with only a few attendees. The Ministry of the Interior then decided to transfer the teaching of chemistry from Professor Walchner to Weltzien. During the subsequent appointment negotiations, Weltzien secured approval for the construction of a new chemistry institute. This functional building, completed by 1851, was an east-to-west block located north of the main building. It included appropriately equipped laboratories and a lecture hall suitable for demonstration experiments. In the ensuing years, the building served as a showcase institute, visited by many of Weltzien's professional colleagues, and taken as a reference design for their own laboratory buildings. Students had the opportunity to carry out necessary laboratory work there. In the network thus developed within the academic world, Karlsruhe's chemistry department became accustomed to uniting research with teaching, which in other disciplines at the Polytechnical College had yet to be established. ⁄ [13]

This development was preceded in 1847 by the splitting of the Higher Vocational School into the Mechanico-Technical School led by Redtenbacher and the Chemico-Technical School initially headed by Walchner. Mechanical engineering and chemistry, the two key disciplines of industrialization, had thus been established as independent courses of study at the Polytechnical College.

The need for properly equipped laboratory space and an auditorium suitable for the subject had motivated the construction of a separate chemistry building. Mechanical engineering, on the other hand, which could be taught in a conventional hall by means of regular lecturing, blackboard notes, and graphics, as well as teaching models, was not given its own building until 1859. Redtenbacher's school, which at that time had 213 students (about 27 % of the 790 regular enrollees at Karlsruhe Polytechnical College in the school year 1859/60), ⁄ [14] received the mechanical engineering building still standing today on the east side of the Courtyard of Honor. Immediately afterwards, the main building was expanded to assume its full original design. By 1864 the east wing had been added and an adjoining lecture hall building to the north. A portal building featuring a passageway into the inner courtyard behind it connected the east and west wings. This complex between the main building, the Chemical

↳ 019
↳ 018

Institute, and the mechanical engineering building henceforth formed the nucleus of KIT's South Campus today.

The Revolutionary Period

The polytechnical college evolved during a time characterized by the emergence of political awareness and public engagement among the populace. Local governments were concerned about the potential spread of the bourgeois revolution in France in 1830. Polytechnical colleges had not yet acquired specific characteristics of a university. But rising technical demands and networking with universities in chem-
↳ 012
istry and other natural sciences like biology were driving forces in this direction. This trend also applied to the students, who around the mid-nineteenth century were still generally referred to as "pupils" or "*Élèven*", despite their self-image becoming more academic much earlier than the school itself.
↳ 013
↳ 031
This is evidenced by the founding of student fraternities, some of which operated in secret. The customs associated with these fraternities — wearing colors and badges, brawls, excessive drinking, and sometimes even deadly duels — are vividly documented in Karlsruhe Polytechnical College's files on disciplinary measures. ⁄ [15] From the government's perspective, this development was bound to cause offense. Since the Wartburg Festival of 1817, an independent political mentality among students toward authorities aiming at national consensus among the still numerous territorial states and at political participation by the citizens had been at the core of the emerging fraternities. Bans on polytechnician fraternities and the persecution of clandestine associations had already created tension in Karlsruhe before the Baden Revolution of 1848–49. At the end of March 1848, a petition signed by 192 polytechnic students was presented to the second chamber of the Baden Diet putting forward the stu-
↳ 015
dents' claim to gaining academic status. The petition demanded the separation of most Vocational Schools from the Polytechnical College, retaining only mathematics classes and the commercial school. The severed Vocational Schools were to be transferred to one of the two state universities as the fifth of the four traditional faculties. If immediate reform wasn't possible, the students demanded an end to the school disciplinary system, freely elective courses, the introduction of salaried private lecturers, the inclusion of lectures on philosophy and economics, the dismissal of several teachers, the establishment of the Teachers' Conference as a public academic senate, the free election of the college director by the teaching staff, and the establishment of a

central library. Apart from grievances about the punitive system, discontent about certain teachers, and the lack of a library, these demands reflected an interest in upgrading the institution's status to that of a university, reforming the private lecturer system, freedom of learning, and university-like self-administration. It is worth listing these demands in detail because many of them were eventually met, albeit considerably later on and were then not deemed revolutionary articles.

Initially, the situation intensified. In early May 1848, about two and a half weeks after the suppression of the revolutionary Hecker uprising headed toward Karlsruhe, around 100 young polytechnicians marched away to Ettlingen and boycotted classes. This form of protest, common at universities for centuries, further emphasized the polytechnicians' claim to academization. The government responded decisively yet pragmatically to the provocation by expelling the protesting students but readmitting most of them shortly after. While this approach quickly quelled the turmoil, the complete military suppression of further unrest in Baden posed an obstacle to elevating the Polytechnical College without it appearing to be a capitulation to student demands. Suggestions from a reorganization commission established by the college in 1848 went unheeded by the supervising ministry for a long time. In this context, the new form of student enrollment introduced in the school year 1852/53, based on university matriculation practices, can be interpreted as a superficial concession. Students henceforth enrolled themselves personally by hand on lists laid out openly on counters, replacing the previous clerk-maintained lists. This change — at the expense of legibility — enhanced institutional self-esteem through such a ceremonious act of enrollment. The slim enrollment booklets were subsequently compiled into matriculation rosters filling substantial volumes in folio format. [16]

↳ 016

The broadened range of courses into the humanities after the mid-nineteenth century should be understood as another concession to student interests. In addition to art history which was essential for architects and went beyond the study of architectural styles, the expanded curriculum included history, literary history, and philosophy. This also followed the longtime director Redtenbacher's personally preferred agenda aimed at increasing respect for engineers in society.

↳ 021

↳ 017

First Zenith as a Model Institution

Around the mid-nineteenth century, both students and teaching staff at the Polytechnical College were envisioning its further development. Chemists, whose work shaped the interplay between research and teaching from the beginning, were a significant driving force. Chemistry was equally represented at polytechnical colleges and universities, with scientists maintaining contact across institutions and showing interest in career paths that alternated between different types of teaching establishments. In Karlsruhe this interconnectedness is evident in the letters preserved in Karl Weltzien's estate from chemist colleagues across Europe. [17] Weltzien had already attracted interest in the institute building mentioned before. His broad scientific network and openness to foreign contacts were important prerequisites for his ability to organize the first international congress of chemists in Karlsruhe in 1860, in collaboration with Friedrich August Kekulé and the Frenchman Charles Adolphe Wurtz. The congress sought to standardize chemical nomenclature and the formulaic representation of substances and atomic and molecular weights. Although the breakthrough leading to the periodic system of the elements did not occur in Karlsruhe, the discussions there are considered a catalyst leading to two participants independently developing the periodic table in 1869. One of them, Lothar Meyer (1830–1895), taught in Karlsruhe.

↩ 011

The need for hands-on experimental work made chemistry dependent on the costly and limited infrastructure of a laboratory. In contrast, the more lecture-based instruction of architects, civil engineers, and mechanical engineers allowed for much larger overall student capacities. While chemists had to share lab benches in their practical courses, architectural and engineering students characteristically received extensive homework assignments, often occupying them for a period of months and involving detailed plan drawings to be submitted for examination. This context helps explain the distribution of the 801 students regularly enrolled at Karlsruhe Polytechnical College in the 1860/61 academic year: mathematics and general subjects 321 (40 %), [18] architecture 73 (9 %), engineering 112 (14 %), mechanical engineering 195 (24 %), chemistry 47 (6 %), forestry 25 (3 %), and the commercial school, postal and agricultural schools [19] combined 28 (3 %). [20] Statistics on foreign students, available from the 1870/71 academic year onward, show that 33 % of students came from outside the German states, demonstrating the college's far-reaching appeal. [21]

↳ 023

↳ 083

In the early 1860s, William Barton Rogers, since 1861 director of the Massachusetts Institute of Technology, visited Karlsruhe Polytechnical College on a European study tour. He described his impressions in a speech given in 1864, which was summarized in The Boston Journal:

> "The Polytechnic Institute at Carlsruhe, which is regarded as the model school of Germany and perhaps of Europe, is nearer what it is intended the Massachusetts Institute of Technology shall be than any other foreign institution. It has an extensive museum of models of all conceivable mechanical combinations, chiefly of metal, which are the objects of constant study by the pupils. Another extensive collection of models represents structures, as roofs, arches, and everything else that concerns engineers or architects. Another collection represents forms used in mining, — the mines themselves as well as implements, — and so [on] all through the practical arts. There are also series of laboratories adapted to the different branches of chemistry. Every part of the establishment is designed for use, and not for show. On the basement floor is a series of workshops, where the students are given practical instruction." [22]

Karlsruhe Polytechnical College had reached the apex of its reputation in the nineteenth century, even before the underlying institutional developmental tendencies could take effect. Rogers's description suggests a leading role among polytechnical colleges, which becomes apparent when comparing the development of such institutions in the German-speaking world. Until the 1860s, educational institutions of this type were redesigned according to the Karlsruhe model, for example in Braunschweig. The polytechnical college in Zurich, founded in 1855, was also based on the organizational structure at Karlsruhe. [23]

Both the student numbers and Rogers's reference to the machine model collection at the beginning of his description reflect the emphasis on mechanical engineering in Karlsruhe's range of subjects at the time. The main attraction was the mechanical engineering course taught by Ferdinand Redtenbacher. As official director of the Polytechnical College from 1857, he was able to prepare for further steps in its institutional development. Before these plans could come to fruition, however, Redtenbacher died unexpectedly early, in 1863.

Small Steps down the Long Road to Academia

The new organizational statutes issued by the Baden Ministry of the Interior in 1865 described Karlsruhe Polytechnical College as a "higher technical school." ⁄ 24 While this allowed the Karlsruhe institution to cultivate an academic claim as a *"Hochschule,"* it still had to call itself a school. These statutes did not represent a significant step forward on the path towards university status in other respects, either. They described the management and administrative structure of the institution as a whole. The technical-school structure described in 1865 was innovative if only due to the elimination of the commercial school and the temporarily extant postal school. The yearly mathematical courses had already been combined into a separate Technical School. The reform in 1832 had already established a larger school board to manage the college, composed of members of the teaching staff, to work alongside the "narrower school board." The new statutes defined this Major Council as a committee consisting of professors. Additionally, there was a Minor Council comprising the director, his predecessor, and three members of the Major Council. No regulations were set on the internal organization of the Technical Schools in 1865. The fact that establishing the teaching program was a matter for the Major Council, rather than the responsibility of the Technical Schools, indicates that the distance from university status persisted. According to the new statutes, the director and the Minor Council had certain powers in disciplinary matters, particularly in imposing punishments of several days in the detention cell and expelling students from the college. Appointment proposals were decided by the Minor Council together with professors of the "relevant subjects," but not by the Technical Schools. The school-like routine of allowing pupils to pass from one school year to the next based on a transfer decision was maintained.

↳ 020

A lesser advancement was the introduction of a voluntary examination for students. This concerned the form of a final examination. Since its beginnings, students of Karlsruhe Polytechnical College had left the institution after completing the curriculum without any regular final examination. This practice was unproblematic for those graduates aiming at civil service, as they had to pass a state examination at the beginning of their career. However, those aspiring to work in the private sector faced the challenge of convincing future employers of the qualifications they had acquired at the Polytechnical College. Attempts to find a solution in the period up to 1865 appear improvised. In 1831, the polytechnician

↳ 014

Heinrich Sprenger received a sheet of paper with the institution's letterhead, on which his lecturers entered in their own varying formulations information about the content taught and the student's achievements. Subsequently, the practice of issuing to graduates a list of the courses they had attended continued until the end of the nineteenth century. According to the 1865 statute, an optional final examination was to be added to this list of course subjects. Although this was not linked to the acquisition of an academic degree, this particularly demanding diploma examination, officially regulated in 1867, served as proof of successful training at Karlsruhe Polytechnical College.

The election of directors remained unchanged in 1865: After a vote held by professors, the appointment was to be issued by the Grand Duke. In their studies, students were expected to follow the curriculum set by their Technical School, though exceptions could be granted in justifiable cases by the presiding boards. Thus by 1865, few of the demands made by students in 1848 had been met. One notable exception was the establishment of a central library, which was founded in 1857. According to the 1865 statutes, one professor was assigned part-time responsibility for managing the library.

After a Slow Start, Achieving Equal Status with Universities

The development of a German federal state, particularly with the establishment of the German Empire in 1871, transformed the landscape for the further development of polytechnical colleges. Although the constituent states retained cultural sovereignty, new, more coordinated forms of collaboration emerged from delegated conferences of polytechnical colleges across the Reich. Prussia assumed a leading role in the development of polytechnical colleges, with three such institutions within its borders after the annexation of Hannover in 1866 and the founding of new polytechnics in Aachen (1870) and Charlottenburg (1879). The founding near Berlin was a pioneer in many respects — including its name, as it was established under the name *Technische Hochschule Berlin*, i.e., Berlin Polytechnic.

The evolution of polytechnical colleges into advanced polytechnics had been under discussion for decades. The students in Karlsruhe were not alone in 1848 in demanding their gaining equal recognition to universities. ⁄ [25] Franz Grashof (1826–1893), who succeeded Redtenbacher, pre-

sented a detailed program in a speech to the Association of German Engineers in 1864. [26] Among the many desirable features of an advanced Polytechnic, Grashof mentioned the possibility of training its own young scientists. In this context, the introduction of private lecturing and the habilitation degree in Karlsruhe in 1868 was an important step. [27]

For the next quarter-century, no significant developments are evident when viewed narrowly through the institutional framework of Karlsruhe Polytechnical College. The shift in 1873 from enrolling students annually to the semester-based enrollment system common in universities was merely an administrative change, albeit one reflected in the course catalogs. The official renaming of Karlsruhe Polytechnical College as a *Technische Hochschule* in 1885 like the majority of other comparable advanced polytechnics, was a purely nominal step not involving organizational alterations. [28] The gilded lettering on the portal of the main building was retained despite subsequent renamings.

In this period the first signs of historical self-awareness appear, with the institution becoming 50 and later 75 years old. A monument dedicated to Ferdinand Redtenbacher was erected in the Ehrenhof, Courtyard of Honor, featuring a larger-than-life bronze portrait bust on a stone pedestal. His 100th birthday in 1909 was also celebrated. [29] The institution presented itself with historical references to its Technical Schools in a parade organized in 1877 to celebrate the 25th anniversary of Grand Duke Friedrich I's reign. The 40th anniversary of his reign occasioned an almost 400-page commemorative publication from Karlsruhe Polytechnic, offering essays about the founding history of Karlsruhe Polytechnical College, including the publication of its founding charter of 1825. [30]

↳ 092

↲ 004

While the institutional form hardly changed, the scientific developments of this period continue to have an impact today. After the founding of the Chemico-Technical Institute and the building erected for it on the north side of the Courtyard of Honor in 1881, chemistry became the most strongly represented discipline in terms of space, with two dedicated buildings containing laboratories and lecture halls. The petroleum chemistry conducted by Carl Engler (1842–1925) and Hans Bunte's (1848–1925) research on the gasification of coal generated a focus on energy sources that still exists at KIT today. One peripheral piece of technological development, but indicative of the Polytechnical College as a place of innovation, is the introduction of the lantern slide projector by

↲ 006
↲ 008
↳ 029
↳ 072

Herbarium of Alexander Braun

ca. 1840

→ p.191



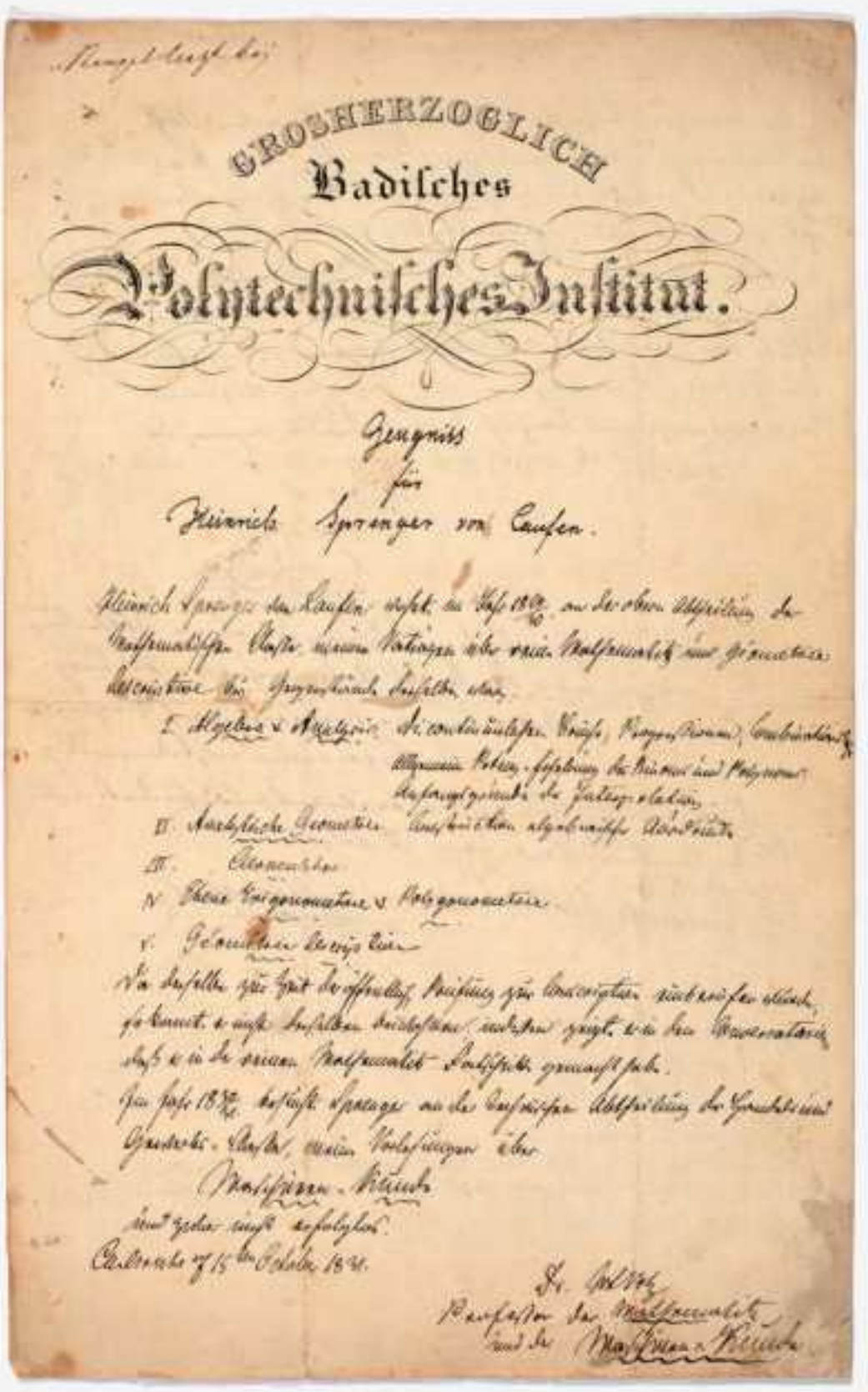
012 Herbarium of Alexander Braun ca. 1840 → p.191



013 “Kneipbild” 1844

→ p.192
↳ 031





GROSSHERZOGLICH
Badisches
Polytechnisches Institut.

Zeugniß
für
Heinrich Sprenger von Caufen.

Heinrich Sprenger von Caufen ist im Jahr 18[illegible] in der oberen Abtheilung der Maschinenklasse meinen Vorlesungen über reine Mathematik und angewandte Mechanik und Physik regelmäßig gefolgt.

I. Algebra und Analysis. Die combinatorische Analysis, Binomialreihen, Combinationslehre, allgemeine Reihenlehre, Differenzen und Summen, Differenzial- und Integralrechnung, Anwendung der Integralrechnung.
II. Analytische Geometrie. Anwendung der algebraischen Analysis.
III. Elementarlehre.
IV. Theorie der Horizontal- und Vertikaluhren.
V. Geometrische Lehre von Linien.

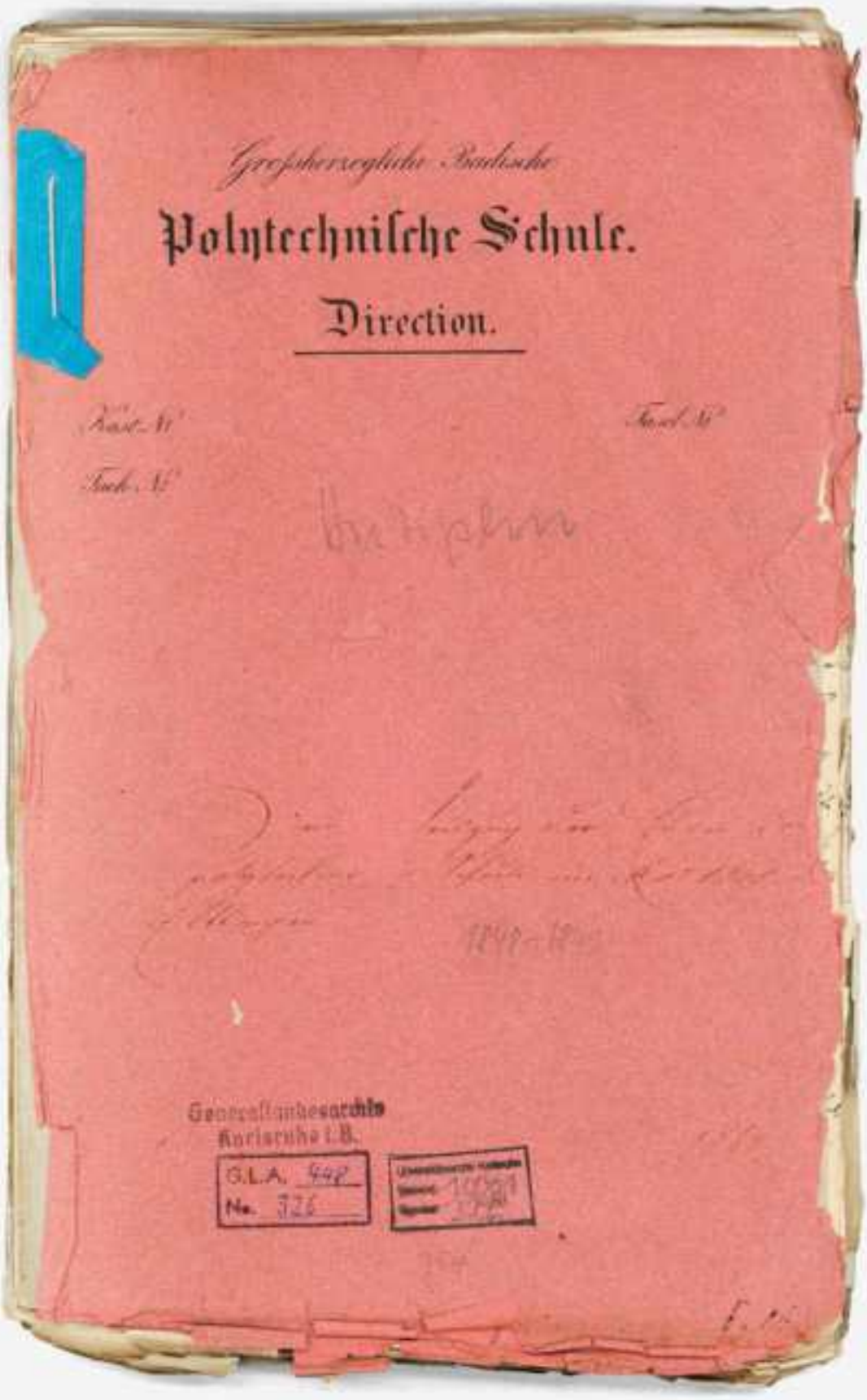
Da derselbe über seine öffentliche Prüfung über die vorgetragenen Wissenschaften befriedigt, die einzelnen Aufgaben richtig gelöst, und die Vorlesungen über reine Mathematik und Mechanik fleißig besucht hat, so ertheile ich ihm hiermit das Zeugniß der Reife.

Gegeben Karlsruhe, am 15ten Oktober 1831.

Der Vorstand der Maschinenklasse und Lehrer der Mathematik
[illegible]

File on a Strike by Polytechnicians 1848

→ p.209
↳ 074



016 Matriculation Roster of Karlsruhe Polytechnical College 1852–1859



→ p.209



017 Painting
“Hohentwiel bei Singen” 1858

→ p.209
↳ 018; 019



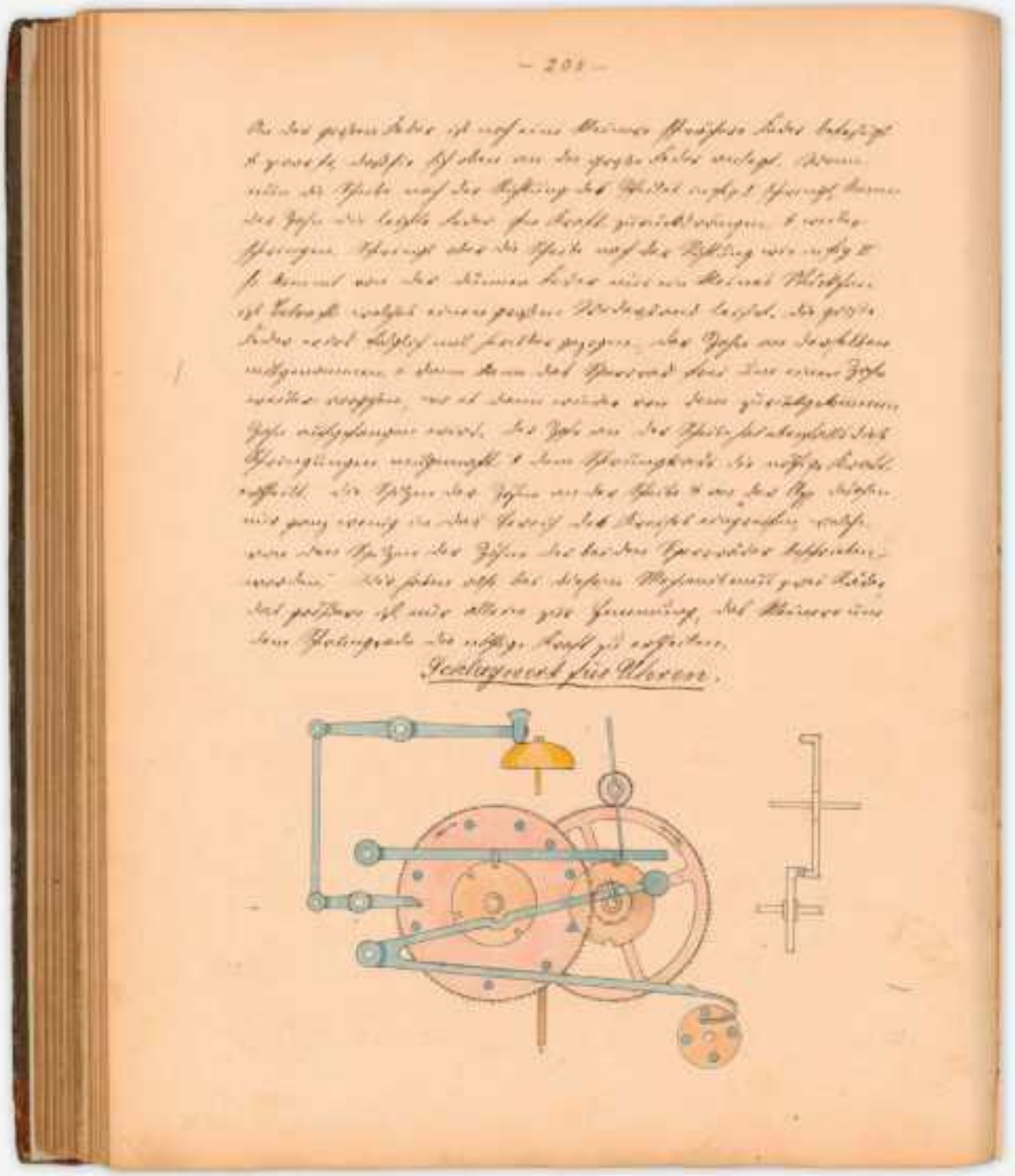
018 Model for Teaching Mechanical Engineering um 1850

→ p.210
↩ 010; 017
↪ 019; 020; 023



019

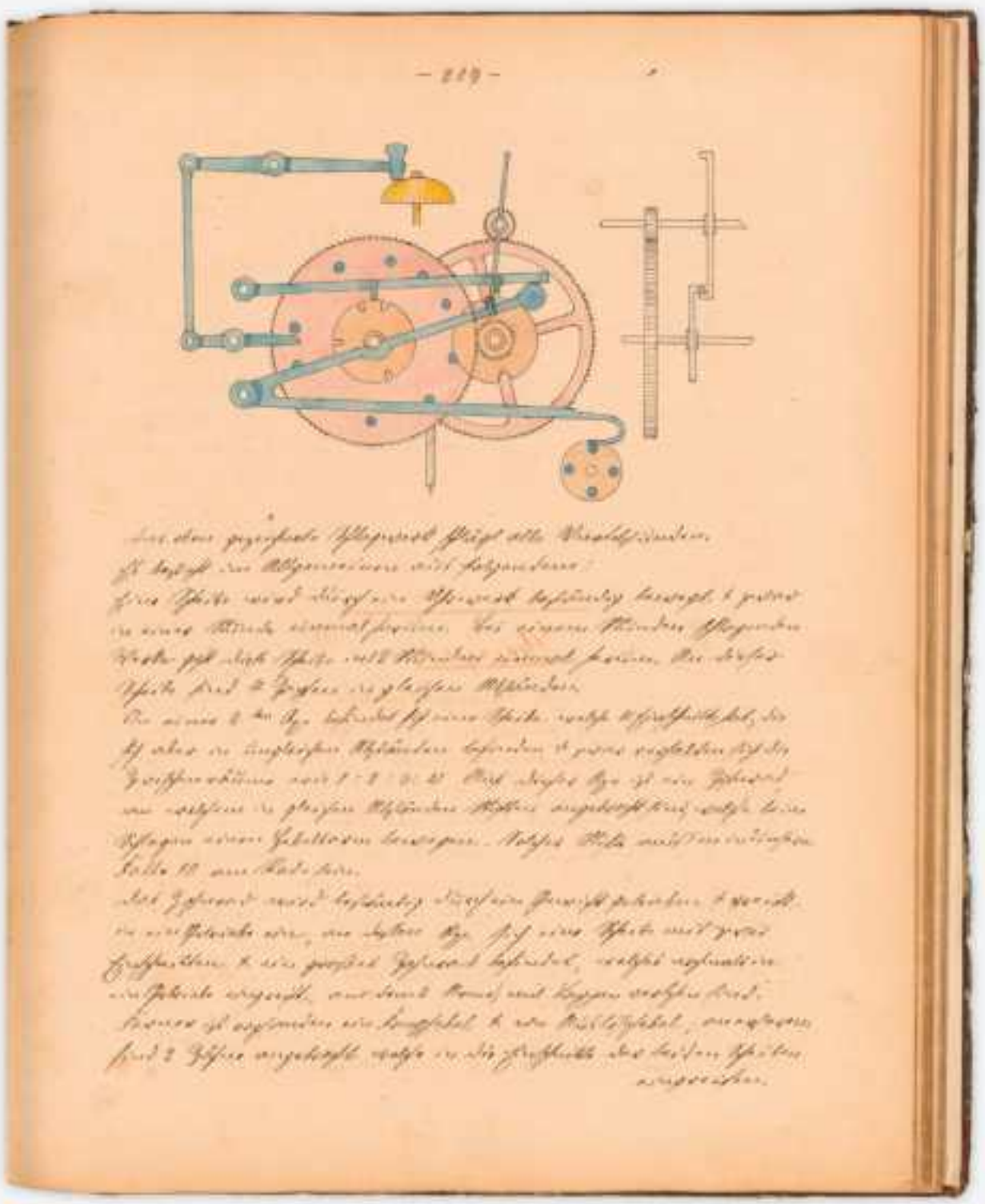
Transcript of a Mechanical Engineering Lecture by Ferdinand Redtenbacher 1856-1857



– 203 –

Stoßwerk für Pfeifen.

→ p.211
↩ 017; 018
↳ 023



020 Mathematical Thread Model 1887



→ p.211
↩ 010; 018



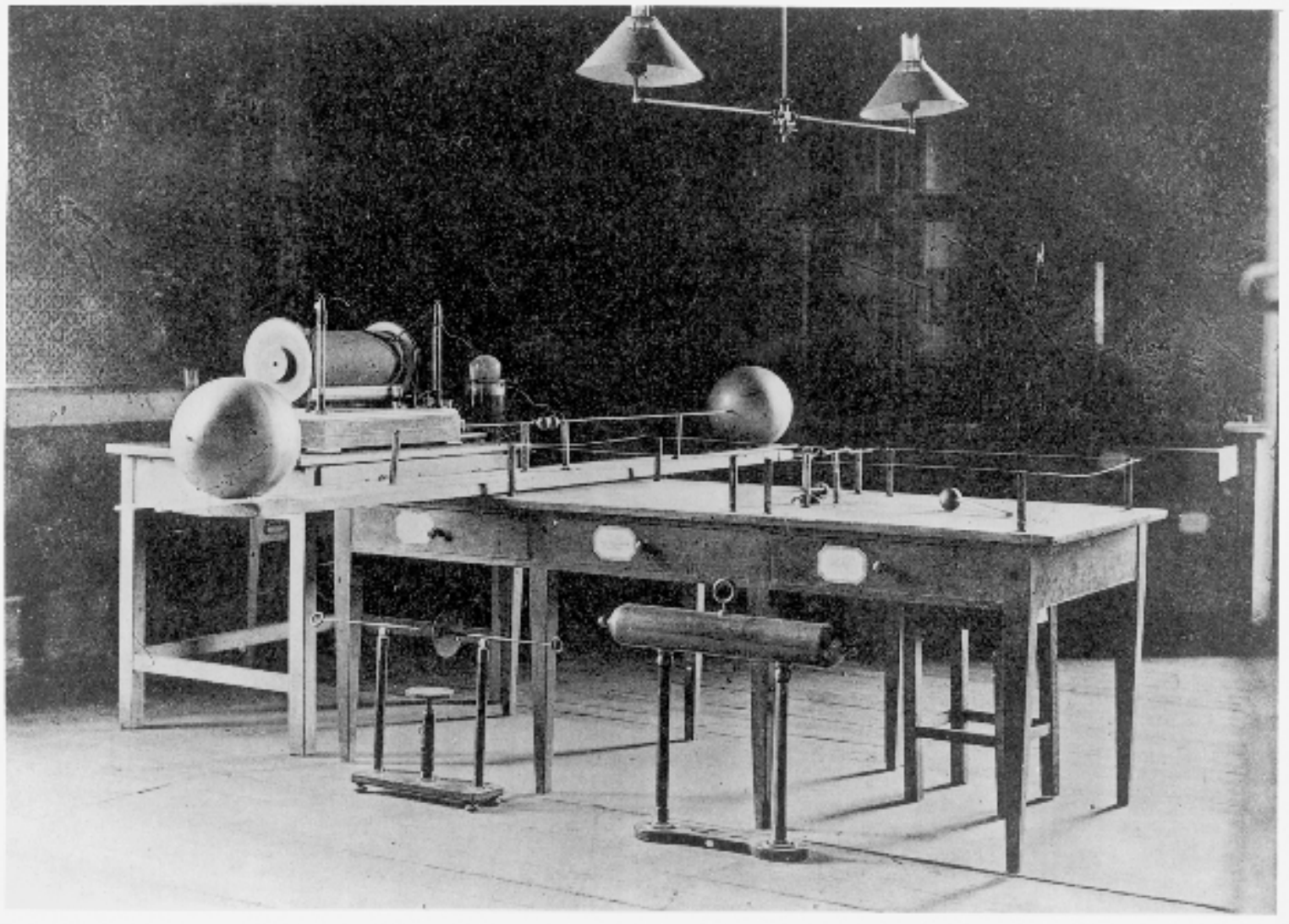
021 Lantern Slide from Bruno Meyer’s Publishing House ca. 1885

→ p.212



Research into Electromagnetic Waves by Heinrich Hertz 1886

→ p.214
↳ 046



022 Research into Electromagnetic Waves by Heinrich Hertz 1886

→ p.214
↳ 046



↩ 021

the art historian Bruno Meyer (1840–1917) to present photographic images of artworks in his lectures at Karlsruhe.

Physics was represented at the Polytechnical College from the outset as an essential fundamental subject for the disciplines taught there. For a long time, its primary function was to serve in the basic training of aspiring engineers and chemists. When the young private lecturer Heinrich Hertz (1857–1894) assumed the physics professorship in Karlsruhe in 1885, he continued the experimental research he had conducted during his university training and professional career, alongside his teaching responsibilities. In 1886, Hertz provided proof that electromagnetic waves behave like light waves. He also succeeded in transmitting these waves wirelessly from a transmitter to a receiver in the lecture hall now

↩ 022

named after him. ⁄ [31] This work laid the foundations for radio and wireless communication — an outcome Hertz himself had not been seeking. His research successes in Karlsruhe paved the way for further advancements in his career. When Hertz left Karlsruhe in 1889, he was succeeded by Otto Lehmann (1855–1922), who dedicated his scientific life to

↳ 024

researching liquid crystals. Like Hertz, he initially focused on fundamental research rather than applications. Lehmann was nominated for the Nobel Prize several times, but it was only decades after Lehmann's death that liquid crystals found an application in flat-screen production. Today, almost every mobile communication device relies on the fundamental research carried out by Hertz and Lehmann in the late nineteenth century. ⁄ [32]

The dedication by these two researchers to concentrated basic research should also be seen against the backdrop that the number of students in Karlsruhe had fallen sharply in the late nineteenth century. Redtenbacher's death in 1863 had led to the first significant drop in attendance. The crisis during the promoterism period or the great depression, which lasted from 1873 to the 1890s, had an even greater impact. Studying became less attractive due to diminished employment prospects. The total number of students in Karlsruhe reached a low point in the summer semester of 1884 with only 255 enrollees. In the 1890s, their numbers rose steadily again to the peak of 1,334 in the winter semester of 1899/1900. ⁄ [33]

In addition to such economic factors, the temporary decline in student numbers at Karlsruhe may be attributed to a significant development of polytechnics as a whole, leading to intense competition — particularly from the newer and better-funded Prussian institutions in Aachen 1870 and

Charlottenburg 1879. In response, the Baden government implemented an extensive expansion program for Karlsruhe Polytechnic. At the turn of the twentieth century, a series of ambitious buildings were constructed, most of which were inaugurated together in a ceremony held in 1899. /[34] This construction program included the architecture building with an integrated assembly hall on Englerstraße, the machine laboratory on the north side of the mechanical engineering building (equipped according to the American model for teaching purposes), the Electrical Engineering Institute to the north of the mechanical engineering building, and the Botanical Institute at Durlacher Tor. Added to this was the new Chemistry Institute building, completed in 1901 to replace the building erected for Weltzien 50 years ago. Although the provision of necessary funding during the constitutional monarchy was not solely the responsibility of the regent, Karlsruhe Polytechnic had reason to express gratitude to its patron, Grand Duke Friedrich I. In 1902, the institution requested that the Grand Duke grant it leave to adopt the epithet *Fridericiana*. The bestowal of this honor brought Karlsruhe Polytechnic among the formal ranks of classical universities adorned with the names of their princely patrons. Further steps toward alignment with conventional universities included the conferral of the title “Magnificence” on the rector, the rector’s chain of office, a large official seal, and the introduction of academic robes for professors.

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↳ 026
↳ 030

These superficial adjustments reflected a substantial change that had taken place in the interim. In 1895, Karlsruhe Polytechnic received new constitutional statutes. /[35] The reorganization of its departments is a particularly striking element of it. The unit previously known as the “Department of Mathematics and Natural Sciences” thenceforward appeared as the “General Department (of Mathematics and Subjects of General Education).” The humanities and social sciences are adopted alongside mathematics, which primarily served the subjects of engineering, and the humanities and social sciences seem to have been placed on a par in the department’s title, offering no less to the main disciplines of the Polytechnic than mathematics. Of particular significance was the establishment of the new Department of Electrical Engineering. The internal organization of the institution was essentially brought into line with the circumstances of a conventional university. The key change was in the departments, which in structure and function were set up like university faculties, each of which drawing up its own teaching program and able to submit appointment nominations. The transition

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↳ 041

toward adopting the title of rector for the institution's head also conformed to university customs.

At the time of the reorganization in 1895, it was still uncertain how the decision would fall regarding an issue that had become a bone of contention between polytechnics and universities: the award of a doctoral degree to a polytechnic graduate. [36] Initially, the absence of a doctoral program at polytechnics had been particularly missed by their enrolled chemists. Graduates of polytechnics had to transfer to universities to obtain the doctorate required for an academic career. Interest in doctoral studies is also evident from a tradition that was practiced from time to time in Karlsruhe. Special examinations in chemical engineering were taken to earn a *Diplom* degree. Candidates wrote and printed an examination thesis known as a "dissertation." This additional certification was even sought by chemists who had already taken their doctorates. [37]

In his plan for the furtherance of polytechnical colleges of 1864, Franz Grashof had not yet advocated this right to confer doctorates. Among German-speaking polytechnics as a whole, this demand was raised during the first joint assembly of delegates in 1880. [38] Such efforts to establish doctoral programs intensified in the mid–1890s and naturally faced resistance from universities. The breakthrough occurred in October 1899 with a decision by the Kaiser, Wilhelm II in his capacity as King of Prussia. The outcome, announced at the centenary celebrations of Charlottenburg Polytechnic, was the introduction of both the academic degree *Doktor-Ingenieur* (Dr.-Ing.) and the regular final examination leading to the degree *Diplom-Ingenieur*. [39] As most other German-speaking polytechnics, Karlsruhe Polytechnic swiftly adopted corresponding regulations: a ministerial letter to this effect is dated December 28, 1899. [40] The first graduation of this kind was recorded in the Big Book of Doctorates of Karlsruhe Polytechnic in 1901, which had clearly been made for ceremonial purposes.

↳ 025

Overshadowed by the engineering doctorate, the "Diplom-Ingenieur" title, which had emerged in Prussia, did not take on the symbolical role of successfully resolving a long-standing dispute with universities. However, in practice, the improved "Dipl.-Ing." degree was of much greater importance until its replacement by the master's degree as part of the Bologna Process. [41] For an entire century this certification thus served as an internationally recognized hallmark of solid education in engineering.

The Introduction of Women into Academic Study

In 1900, women in Baden were granted the right to qualify themselves for admission to academic study — this was another profound change with consequences that were hardly anticipated at the outset. [42] Previously, women had been allowed to attend universities as guest auditors, but like men in this guest category, they could not take qualifying examinations for a degree. Due to the pronounced gender roles of the time, only a few women initially appeared at Karlsruhe Polytechnic after the way had been cleared for them to regular matriculation. During the Weimar Republic, the proportion of women was still around two percent, which was a typical figure for polytechnics of the period.

The first graduated female student in Karlsruhe was
↳ 028
Magdalena Meub (1881–1966). After completing studies in pharmacy, she became the first female German pharmacist to hold an academic certificate in the field. In the following decades, chemistry, pharmacy, and mathematics were subjects frequently chosen by female students. [43] The first woman to be awarded a doctorate by Karlsruhe Polytechnic did so in a scientific discipline. In 1915, the chemist Irene Rosenberg (1890–1986) earned the academic title of Doctor of Engi-
↳ 034
neering. [44] Initially, few women studied engineering. The first degree in architecture awarded to a woman after completing a regular course of study was in 1913, [45] while in civil engineering and electrical engineering, this milestone was reached in 1924. [46] Mechanical engineering, however, had to wait until 1953 for the first woman to pass the Diplom examinations in this field. [47]

Up to the End of World War I: New Research Topics Through Industrial Collaborations – Colonialism – War Research Efforts

The development of ammonia synthesis by Fritz Haber
↳ 036
(1868–1934), who had been employed at Karlsruhe Polytechnic since 1894 and worked together with the soda trust Badische Anilin- und Sodafabriken (BASF), exemplifies a significant shift in research practices. Previously, scientists at various universities had attempted to produce ammonia (NH_3) from hydrogen and atmospheric nitrogen, motivated by the need to find alternatives to guano fertilizer imported from South America and Chilean saltpeter. At the turn of the twentieth century, the finite nature of these natural resources, essential for food production, was recognized as a pressing future challenge for densely populated industrialized

nations. Fritz Haber successfully developed a process for ammonia synthesis, carried out at approximately 175 bar and 550 °C, in a model plant using osmium as a catalyst. Unlike earlier researchers such as Hertz and Lehmann, Haber's work was not conducted in isolation as a solitary professor experimenting away or peering into a microscope. Under Haber's leadership since 1906, the Institute of Physical Chemistry and Electrochemistry assembled an international team reinforced by BASF employees. The contributions by highly qualified technicians and laboratory assistants were another factor leading to success. As part of his collaboration with BASF, Haber allowed the company to utilize the patent he had filed in 1908 for ammonia synthesis which had been granted in 1911. Industrial production necessitated the development of a large-scale process centered around a reactor column as tall as a house with catalysts. Carl Bosch (1874–1940), BASF's chief scientist, led this work based on Haber's research in Karlsruhe. Ammonia production at the Ludwigshafen-Oppau plant commenced in 1913. The process gained additional significance in 1914 because it enabled the German Reich's military production of explosives to become independent of saltpeter imports, which the blockades during World War I had restricted. However, this development is only indirectly related to the history of Karlsruhe Polytechnic, as Fritz Haber had moved away to Dahlem near Berlin in 1911 to become director of the newly founded Kaiser Wilhelm Institute of Physical Chemistry and Electrochemistry. /48

What follows is of relevance here, though, because Haber's work during the war also led to ongoing discussions in Karlsruhe about how to evaluate his work and character. The actual trigger of this critique was his advocacy of chemical warfare, which ranged from selecting the chemical agents to directing their deployment in battle. Probably shortly after the first large-scale poison gas attack occurred near Ypres in 1915, resulting in thousands of deaths and injuries, Ernst Schlumberger (1887–1943), who worked for a time at Haber's former institute in Karlsruhe, produced a charcoal drawing. It depicts Haber as a "gas warrior" led by the devil in the trenches. This ambivalence surrounding the merits of Haber's work persists to this day. After the war, Haber was awarded the Nobel Prize in Chemistry for developing ammonia synthesis — roughly at the same time that he was being sought by the Allies, Germany's opponents, as a war criminal for his role in the development of poison gas during the war. In the early 1990s, one of the reactor columns BASF had used for synthesizing ammonia was erected as a technical

↳ 033

monument on the university campus, adorned with a plaque remembering Haber and Bosch. Subsequently, anonymous individuals attached a similarly large cast-iron plaque, weighing about 40 kg, to the column. The inscription on this additional plaque pointed out Haber's and Bosch's wartime activities. The street sign on Fritz Haber Weg, which begins at the reactor column, has repeatedly been the target of critical vandalism, ranging from crossings out the name in felt-tip pen, to creative alterations.

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↳ 096

The Teaching and Experimental Gas Institute of the German Association of Gas and Water Experts, established in 1907 at the initiative of Hans Bunte, is another noteworthy example of industrial collaboration. This facility, affiliated with the Institute of Technical Chemistry and commonly known as the "Gas Institute," was founded with contributions from companies. It was primarily employed with testing materials and processes for the production of so-called town gas from coal. Initially, this energy source was used for lighting, later becoming primarily a heating source for homes, water boilers, and kitchen appliances, until it was eventually replaced by natural gas. As part of the Gas Institute's collaboration with supply companies, annual courses on gas technology were also held for gasworks employees jointly with the Institute of Chemical Engineering.

↳ 029

The period immediately preceding World War I was one of stability for Karlsruhe Polytechnic, with student totals consistently ranging between 1,200 and 1,400. Unlike polytechnics in northern Germany, Karlsruhe Polytechnic did not experience significant structural growth from ship building. According to the latest findings, endeavors to exploit colonial resources did not have a notable impact on its development either. However, it is evident that academics at the Polytechnic took an affirmative stance on both naval and colonial issues. Karlsruhe Polytechnic hosted lectures on colonial topics, with hydraulic engineer Theodor Rehbock (1864–1950) and art historian Adolf von Oechelhäuser (1852–1923) emerging as prominent activists. Prior to his appointment in Karlsruhe, Rehbock had left on a research trip to German Southwest Africa (modern-day Namibia). After joining the Karlsruhe faculty in 1899, he published works on colonial water management, aimed at facilitating land use by German settlers. General programmatic statements by him also reveal typical colonialist ideas, such as asserting that subjugated people were actually in need of forced re-education in the culture of their conquerors. He served on the board of the Karlsruhe section of the German Colonial Society and thus

helped organize the German Colonial Hunting Exhibition in Karlsruhe in 1903. [49] Oechelhäuser, who for a time served as the section's first chairman, welcomed the German Colonial Society's general meeting in Karlsruhe in 1903 in his capacity as rector of Karlsruhe Polytechnic. He emphasized service to colonial efforts that the *Fridericiana* could offer. Indeed, as a plantation shareholder, he had a personal stake in the colonial cause. Both Rehbock and Oechelhäuser campaigned outside of Karlsruhe as well, participating in congresses and conferences on colonial issues. Other professors, including Carl Engler and Franz Grashof, were also members of the Colonial Society. The colonial activities at Karlsruhe Polytechnic persisted into the Nazi era and require further research. [50]

The outbreak of World War I strongly restricted regular operations at Karlsruhe Polytechnic due to the conscription of students, younger academics, and staff members. From June 1915, the city of Karlsruhe became a target of French air raids, resulting in nearly 170 civilian deaths. The Polytechnic was among the buildings hit by bombing. While there is evidence that its members were professionally involved in war-related tasks, too little is known to provide a comprehensive picture. The surveyor Josef Bürgin (1872–1917) employed at Karlsruhe Polytechnic produced calculation tables for anti-aircraft fire. Wilhelm Paulcke (1873–1949), a geologist specialized in the Alpine region and a pioneer skier, was active on various fronts. In 1915, he organized mountain infantry units equipped with skis in Turkey. [51] His colleague, the architect professor Friedrich Ostendorf (1871–1915), who had voluntarily enlisted himself, died in France. Among the documentable German members of the polytechnic, 196 lost their lives during the war. [52]

↳ 032

From the Weimar Republic to the End of National Socialism

The period after World War I had ended was marked by an influx of returning students of various ages to Karlsruhe Polytechnic. A shortened trimester between the winter term of 1918/19 and the summer term of 1919 was introduced in an attempt to redress the conditions imposed by the war restricting the ability to follow a course of study.

The unrest that led to the end of the German monarchies in November 1918 also affected Karlsruhe Polytechnic. Under the new government, a Voluntary Student Defense Force was supposed to be called up in January 1919, com-

posed of 50 students, as one precautionary measure against more revolutionary uprisings. The aforementioned Wilhelm Paulcke was in charge of organizing it. /53

When subsequent student demands were raised throughout the Reich for academic sports to compensate for the abolished compulsory military service through the Treaty of Versailles, Paulcke seized this opportunity to resume his pre-war efforts to expand the sports infrastructure. Karlsruhe Polytechnic acquired spacious sports facilities. These included a stadium in the area in front of today's main auditorium, the Audimax, which is now partly rebuilt, and adjacent sports facilities to the north, including tennis courts. By 1931, a grandstand building had been erected at the stadium, featuring a gymnasium in the basement, a pool, and rooms for the serial medical examinations of students by sports physicians. To track student participation, performance books were issued for entry of the results of completed exercises each semester. Paulcke's efforts to ensure maximum student involvement in academic sports activities were supported by student fraternities. /54 In addition to athletic disciplines, shooting training was also offered at the students' request at the Karlsruhe Shooting Club, funded by the polytechnic. /55

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The aftermath of Germany's defeat in World War I led to an unfavorable overall economic situation. The severance of Alsace and Lorraine exacerbated circumstances for Baden, as these regions were lost to Baden as areas of commercial trade and as environs for those interested in studying. Despite the closure of pharmacy in 1924, /56 once the returning veterans had graduated, student enrollments ranged between 1,256 and 1,362, thus remaining steady at pre-war levels.

To address students' problematic access to convenience stores, a refectory was set up in the auditorium building in 1921, and in the following year a recreation room. In April 1923, Student Services (*Studentendienst e.V.*) was founded to sponsor these facilities, which later evolved into the current Association of Student Affairs (*Studierendenwerk*). Student Services responded to the hyperinflation of fall 1923 by issuing emergency money vouchers. By 1930, through fundraising, a *Studentenhaus* was constructed on what is now Adenauerring. This new facility featured a refectory, terrace café, banquet hall, and student accommodations. /57

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In 1921 the building complex for the civil engineering department near Durlacher Tor and a new River Engineering Laboratory could be inaugurated. The Doric columns and gabled façade of the department building copied ornamental elements from the city of Karlsruhe

The wartime experiences and surrender, along with the restrictions imposed by the victorious powers, significantly impacted the mentality at Karlsruhe Polytechnic. On the occasion of its centenary celebrations in 1925, the quad between the oldest buildings on campus was redesigned as a site for historic commemoration. The center of this square, now known as Ehrenhof — Courtyard of Honor — was elevated, and a statue of the ancient goddess Pallas Athena was erected there on a stone pedestal bearing the names of the war dead. As was common throughout the German Empire, Karlsruhe Polytechnic consciously sought to circumvent or compensate for restrictions set by the Treaty of Versailles. Apart from its academic sports serving as a substitute for military exercises, the Academic Flying Group of Karlsruhe must also be mentioned in this connection. Similar student groups were formed at other colleges as well in response to the ban on military aviation. [58]

↳ 093

Karlsruhe Polytechnic otherwise evolved primarily in response to industrial needs and the existing opportunities arising out of them for cooperative arrangements, taking the prewar establishment of the Gas Institute as a model. The electrical engineer JoachimTeichmüller (1866–1938) founded in 1922 the Institute of Lighting Technology with support from relevant commercial companies. The university's expansion in applied research continued with the establishment of the High Voltage Institute in 1930, another offshoot of the Institute of Electrical Engineering. The Department of Forestry, which had been based in Karlsruhe since 1832, was transferred to Freiburg University in 1920.

↳ 041

The Department of Mechanical Engineering aligned itself with the emerging automotive industry through Hans Kluge's (1881–1958) Laboratory for Machine Elements and Motor Vehicles in 1928. This development, coupled with specialization in transport within the Department of Civil Engineering, laid the foundation for a focus on mobility that remains a cornerstone of KIT's research and education today.

The Chair for Thermodynamics, by contrast, which established itself in the mechanical engineering department in 1920, delved deeper into fundamental research. After Wilhelm Nußelt's (1882–1957) brief term as the founding chair, Rudolf Plank (1886–1973) took over the position.

During Plank's tenure two significant long-term expansionary processes were initiated. Firstly, in the 1920s, Plank supported the development of chemical engineering, which focused on equipment for industrial production. In 1928, Emil Kirschbaum (1900–1970) received a lectureship in apparatus engineering. As Plank's assistant, Kirschbaum developed a curriculum for chemical engineers, took his habilitation degree in 1930, and as professor founded the Institute of Apparatus Engineering at Karlsruhe Polytechnic in 1941. This initiative ultimately led to the establishment of the Department of Chemical Engineering. Secondly, Plank pursued research on food preservation through refrigeration. His interests, stimulated by the needs of a wartime economy during World War I, culminated in the founding of the Reich Institute of Food Preservation in 1936. /59

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The political mood at Karlsruhe Polytechnic mirrored the polarization prevalent in the Weimar Republic. A notable trend throughout this period was the move of many students towards right-wing views. This became evident already in 1919 during appointment proceedings for the successor to the chemist Hans Bunte, when the Karlsruhe student organization openly expressed anti-Semitic opposition to Jewish candidates under consideration. On the other side, physical chemist Georg Bredig (1868–1947) defended pacifist views and became a prominent spokesman of European unity during a postwar period heavily influenced by revisionist positions. This successor to Fritz Haber was no marginal figure but a multiply acknowledged scientist who served as rector in the academic year 1922/23. He also took a stand by refusing to make a room at the Polytechnic available for a right-wing extremist event. /60 Karlsruhe students, on the other hand, as at other universities, tended to continue to favor Nazi views more strongly than the general population. /61

The advent of National Socialist rule in the spring of 1933 fundamentally altered the operational framework of Karlsruhe Polytechnic, for the German empire and its states were transformed into a dictatorship. Important decisions regarding academic matters were centralized at the Reich level. The previously autonomous appointment procedure for management positions became subject to political monitoring. In Karlsruhe, this shift in power dynamics manifested in the ousting of the rector. The literary scholar Karl Holl (1886–1971) was replaced by mechanical engineer Hans Kluge (1881–1958), a candidate favored by the National Socialists. The politicization of academic appointments continued with the appointment of lighting engineer Rudolf Weigel (1899–

1955) as rector in 1937. Weigel's career advancement was characterized by a fusion of professional qualifications and his political activism as a National Socialist particularly when his habilitation proceedings in Karlsruhe faced professional objections.

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The National Socialist state's aggressive internal policies violated values already recognized as fundamental to civilization and which today have the status of fundamental rights in the German constitution. At Karlsruhe Polytechnic, these changes became evident early on, in the spring of 1933 through government regulations leading to the dismissals of lecturers and academic staff. These measures primarily targeted individuals who were persecuted on the basis of National Socialist racial ideology or as political dissidents. The regime expelled 11 out of the 41 full and associate professors at Karlsruhe Polytechnic, which comes to more than a quarter of this group. Jewish faculty members were affected, such as the professor of chemical engineering Paul Askenasy (1868–1938), the professor of physical chemistry Georg Bredig, or the professor of organic chemistry Stefan Goldschmidt (1889–1971). Others lost their jobs as political dissidents, such as the physics professor Wolfgang Gaede (1878–1945) and history professor Franz Schnabel (1887–1966). /62 This persecution is remembered at KIT on a memorial plaque in the Courtyard of Honor since 2016.

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Jewish students, initially facing increasing obstacles to their studies, were banned from obtaining doctorates in 1937 and denied enrollment entirely in 1938. A nationwide regulation stripped emigrants of their doctoral degrees. During the November pogroms of 1938, students in a lecture hall witnessed the mistreatment of people of the Jewish faith on Kaiserstraße. By this time, the polytechnic had ceased to be a place where any critical attitude toward these events could be shown without serious consequences. In his memoirs about this time, Rudolf Plank wrote: "The informant system was flourishing." /63

↳ 050

The National Socialist regime behaved with similar aggression abroad. The four-year plan adopted in 1936 aimed to prepare for war against the Soviet Union. This strategy, focused on rearmament and a war economy, was evident not only in the demands placed on institutions of higher education but also in the opportunities it created for funding research projects or even establishing permanent structures for emerging fields of study. A film from 1937 promoting studies at the Karlsruhe Polytechnic broadcast the statement:

↳ 045

“The engineer of his nation is a toolmaker and armorer. His creations make bread and wages, fulfill the Führer’s plans, and make Germany more powerful and more beautiful with each passing day”. Karlsruhe Polytechnic found opportunities for development even given its strategic vulnerability due to its proximity to the border. Chemistry, for instance, found relevance in the efforts to gain self-sufficiency with raw materials, and chemical engineering was important in the refinement of raw materials. The development of refrigeration technology, pursued by Rudolf Plank, and the founding of the Reich Institute of Food Preservation should also be understood in this context. In Plank’s case, despite being recognized by the regime as an opponent, he was able to maintain his personal freedom by contributing to a field of research deemed critical to the war effort. Additionally, the rapid expansion of the arms industry made education in engineering provide significantly better career prospects than in the crisis period of the early 1930s.

The National Socialist state sought totalitarian control over individuals. The Reich-wide introduction of new matriculation cards in 1934 bears witness to this. /64 These cards requested extensive personal information beyond academic details, including origin, specific skills, sports achievements, musical abilities, various kinds of driver’s licenses, and even poster-writing capabilities. While at university, students were supposed to be politically educated in Nazi ideology that was

↳ 046

reinforced by their membership in a mass organization. /65 The Oskar Stäbel House — now the Franz Schnabel House — was rededicated for this purpose. At its inauguration in June 1934, it was listed as a joint institution of the Karlsruhe student organization and the National Socialist German Students’ League (NSDStB). It provided barracks-like accommodations for “50 – 60 comrades and their leader,” with studies

↳ 043

regulated by a military-style schedule. /66 This broad conception of a thoroughly regulated coexistence of students was abandoned soon afterwards. What persisted was the totalitarian aim to supplant existing student associations with Nazi-controlled organizations. This aim was evident in the elevated interest in organized academic sports by the University Sports Office of the Nazi Storm Detachment, SA. The pivotal step, though, was the Reich-wide dissolution of traditional student fraternities in 1935, to replace them with regime-controlled student comradeships.

The Karlsruhe *Thingstätte* project, planned for the northern edge of campus, intended to connect the polytech-

↳ 042

nic with the propaganda apparatus. Architecture professor Hermann Alker (1885–1967), who taught at the Karlsruhe Polytechnic and was temporarily commissioned by Hitler to redesign Munich, designed this marching and staging ground for mass events. /67 However, the Thingstätte never materialized, neither were the planned new buildings for the Gas Institute which Alker's office had redesigned together with monumental block development on campus. /68

During World War II, which began in 1939, there was a heightened demand for the expertise at polytechnics. Scientists and students from Karlsruhe were involved in producing war equipment and conducting research directly aimed at military applications. However, due to a lack of thorough research, it is not yet possible to present a complete picture. The following haphazard examples of such involvement suggest widespread participation campus wide, which agrees with the broader narrative of self-mobilization among the technical elite. Otto Kraemer (1900–1986), a professor of mechanical engineering, worked on torpedo development for the German navy in Eckernförde. /69 Mechanical engineering students worked in weapons factories, focusing, for instance, on improving armored vehicles. /70 The Institute of Lighting Technology carried out research on methods to enhance the visibility of targets at night. /71 Under the supervision of Karlsruhe physicist Franz Wolf (1898–1984), the doctoral student Emil Frank (*1913) conducted experiments at a secret facility for the Naval Observatory in Greifswald, focusing

↳ 049

on fog removal. At the Institute of Applied Mathematics, calculations were performed on the aerodynamics of artillery shells, and, according to a contemporary witness, weapons

↳ 050

research was also undertaken on the V2 rocket. /72 This list of activities could be easily extended. Many scientists may have viewed their contributions to the Nazi regime's interests and its aggressive war activities as justifiable acts of loyalty to their country. However, considerations that work for this government and this war could have a culpable connection with the breaches of civilization committed have not been found expressed in sources of Karlsruhe Polytechnic. Rudolf Plank, known for his critical stance toward the regime, reflects in his memoirs on the importance of his research on food preservation for the war effort. He also expresses sorrow over the genocide of Jews in Eastern Europe, without addressing any broader implications of this attitude on his own work. /73

Regarding the exploitation of forced laborers that researchers at other polytechnics have uncovered, few suspicious cases emerge from among the fragmentary local records on Karlsruhe Polytechnic.

The war unleashed by the National Socialist regime eventually turned on Karlsruhe. Bombing raids devastated a large portion of the premises. Only ruins were left of the main building, the Chemical Institute, and the Electrotechnical Institute among other destroyed buildings.

↳ 048

Restart and Expansion into a University for the Masses

The destruction caused by the war initially raised doubts about the continued existence of Karlsruhe Polytechnic, with a relocation to Ettlingen under consideration. The resumption of teaching operations was complicated not just by the damages. Toward the end of the war, numerous institutes, as well as the rectorate and library had been relocated to rural areas, sometimes far away, along with their equipment, files, and books. They had to be transferred back again, some to temporary quarters. Several institutes and the library initially took up residence in rooms in the former telegraph barracks on Hertzstraße. Due to the requisitioning of the sports facilities for use by the 106th US Infantry Division, occupying forces were present on campus. Karlsruhe Polytechnic managed the initial reconstruction measures on its own: Aspiring students were required to contribute 1,000 hours of labor organized by a construction service, which began by clearing away rubble and sorting recyclable materials out of the ruins. [74] Despite these obstacles, lectures already resumed in the fall of 1945. [75] The Polytechnic held a reopening ceremony for the summer semester of 1946. A large number of the new students were former forced laborers who had been housed in camps for displaced persons. [76] Rudolf Plank held the office of rector for the first postwar tenure. He was a particularly fitting choice, not only because of his political stance and existing integration in the faculty, but also because he was fluent in the languages of all the occupying powers.

↳ 051

Some teaching staff had aligned themselves more closely with the National Socialist regime than had been necessary to keep their positions. The first ones to be suspended by the occupying government occurred in May and June 1945. At least 13 members of the teaching staff were removed, including Rector Rudolf Weigel, who had held this office from 1937 to 1945, followed by Karl Georg Schmidt (1902–1976), who had succeeded him shortly before the end

of the Nazi regime. [77] These dismissals targeted persons who had enthusiastically embraced the regime in the hope of advancing their careers. The professor of business management, Otto Mickley (1892–1952), was affected as well as Professor Alfons Bühl (1900–1988), a prominent supporter of the Aryan physics movement "Deutsche Physik," or the philosopher and sorcery researcher, professor Arnold Ruge (1881–1945). A number of other professors were removed from their chairs but remained as so-called "ordinary laborers" in a lower-level position at the Polytechnic. [78] As a rule, subsequent denazification proceedings negotiated whether those dismissed or still serving individuals could be classified as "fellow travelers" or even as "exonerated," allowing them as a consequence to return to or retain their former positions. [79] In proceedings somewhat similar to court cases, the denazification tribunals weighed the incriminating and exonerating evidence against each other. The outcome often depended on the availability of positively disposed personal affidavits. [80]

↳ 052

At its own initiative, Karlsruhe Polytechnic decided to revoke several honorary degrees that had been awarded to representatives of the Nazi state up to 1945. [81] Those who had begun their academic careers under National Socialism and now found themselves in the democratic order of the Federal Republic of Germany were able to seize the new opportunities to identify themselves with liberal values and make a name for themselves as supporters of humanism. One example of such a change is the mechanical engineering professor, Otto Kraemer (1900–1986). [82] During the Nazi era, he had produced an ideologically conformed propaganda film and had worked on torpedo design. He emerged from denazification ranking as a fellow traveler. In the 1950s, in addition to his academic position, he was a sought-after lecturer about reflections on the possibilities of a humane existence in industrial society.

↳ 045

The surviving documentation does not indicate that special effort was expended on investigating the level of a candidate's adherence to National Socialism in nominations and appointment procedures. However, in some cases, it is difficult to imagine that nothing was known about their activities during the Nazi era. This applies to the jurist Gustav Klemens Schmelzeisen (1900–1982), appointed in 1961, who became famous in the Federal Republic as a historian of law but had formerly glorified changes in legal standards and the rule of law under National Socialism in ideologically tinged writings. Questions also arise about whether it was unknown

at the appointment of the architect Egon Eiermann in 1947 that he had been involved in arranging the propagandistic exhibition “Gebt mir vier Jahre Zeit” (Give Me Four Years Time) in 1937. When the later pioneer in computer science, Karl Steinbuch (1917–2005), was appointed to Karlsruhe Polytechnic in 1958, his SS membership at the age of 16 probably couldn’t have been known to any of the decision makers. [83] However, given the customary handling of Nazi pasts at the time, it is likely that it would not have affected his hiring at the Polytechnic anyway.

The years leading up to 1950 were characterized by shortages and improvisation. Securing food and heating supplies was a major concern also for people connected with the polytechnic. The disciplinary files on students who had committed offenses suggest that they were not always able to provide for the necessities of life by working or petitioning. The majority of offenses were related to black marketing and theft, and there were also instances of ration card forgery. [84] To visit an academic conference involved not only obtaining the appropriate passes for travel between occupation zones but also securing food ration coupons. [85] The material equipment on campus was initially very basic, relying heavily on whatever was already on hand. Due to the general housing shortage, some teaching staff and their families lived under crowded conditions in former barracks buildings of the present-day *Westhochschule* on Hertzstraße. A hall of residence was set up in the complex for students. [86]

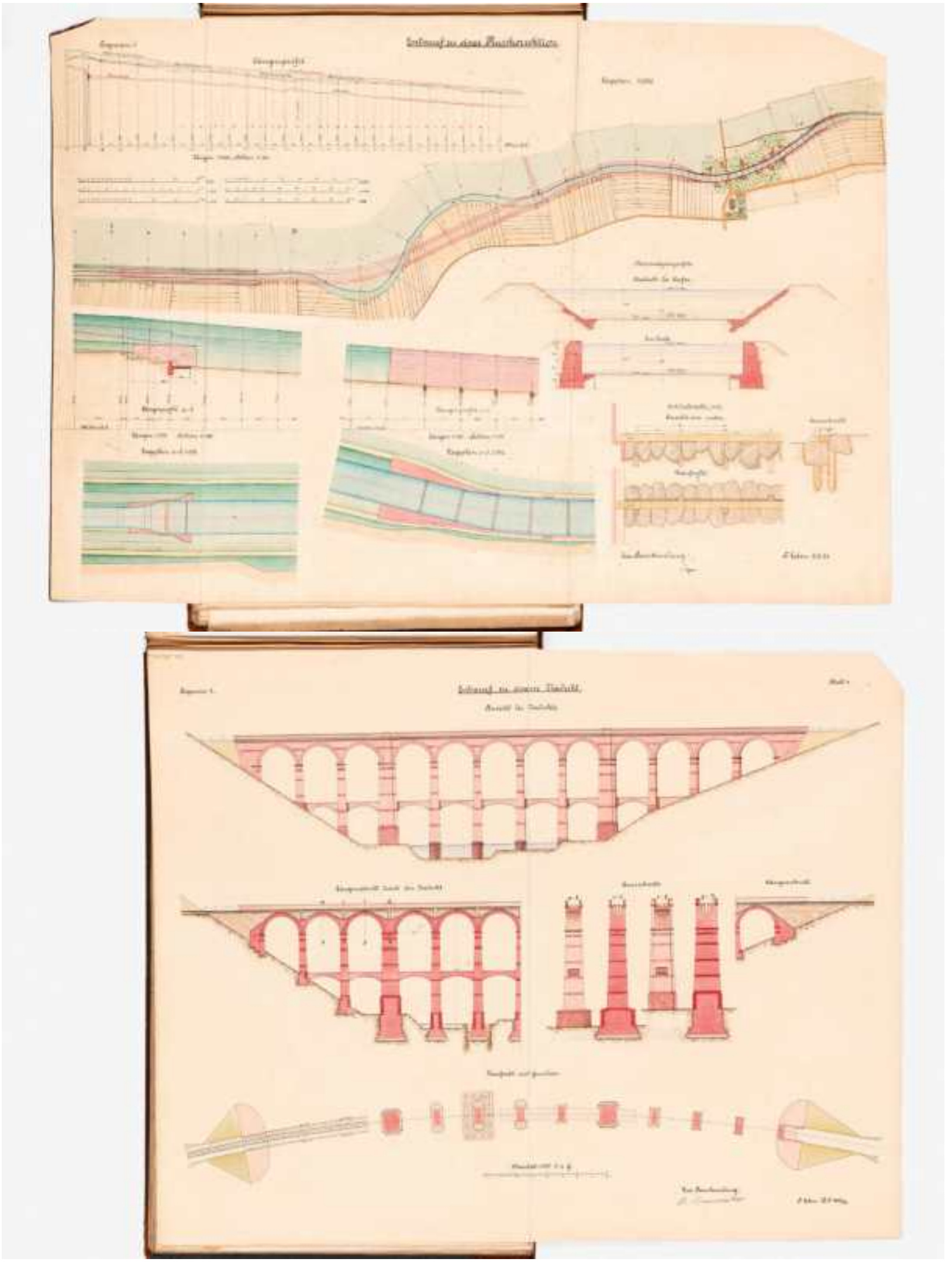
↳ 055

Latest by 1948, following the currency reform in the western zones leading to a revival of economic life, studying engineering offered promising prospects of high demand and diverse career opportunities. Soaring enrollment figures reflected the booming economy. By the winter semester of 1946/47, the Polytechnic had already enrolled almost 3,000 students, the highest total in its history up to that point. [87] This figure increased to 3,892 by the following winter semester and reached the 5,000 mark by the winter semester of 1958/59. Such rising numbers could not be accommodated by simply rebuilding whatever had been lost.

The *Studium generale* curriculum introduced in the winter semester of 1949/50, was conceived as a new approach to civic education of students. It offered elective courses in basic education from which students were required to select four semester hours per week during their first and fifth semesters. [88] This program was complemented by a series of events, often featuring distinguished external speakers. New cultural offerings included the promotion

023 Drawing Exercises by a Civil Engineering Student 1891–1893

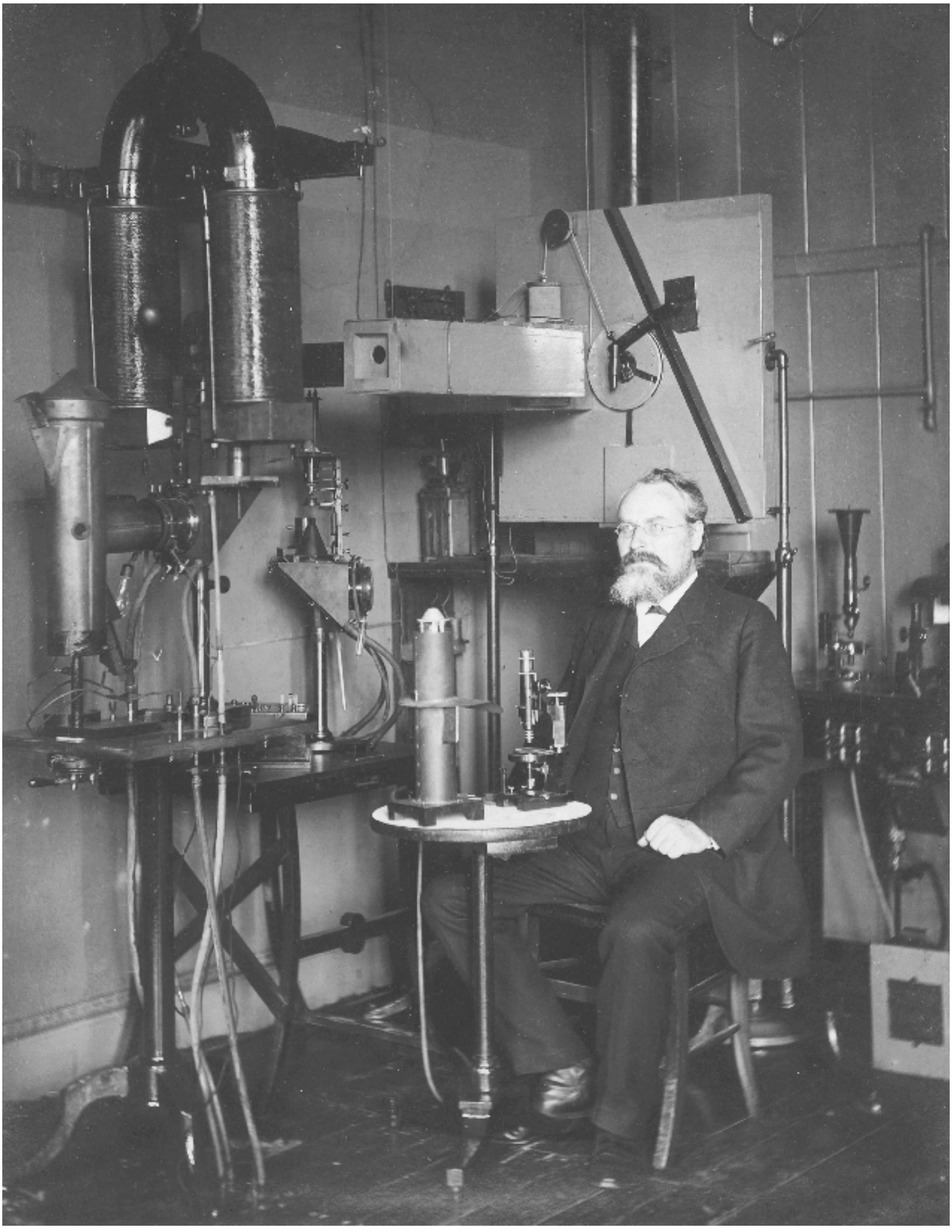
→ p.215
↩ 010; 018; 019; 020



024 Polarizing Microscope from Liquid Crystal Research ca. 1890

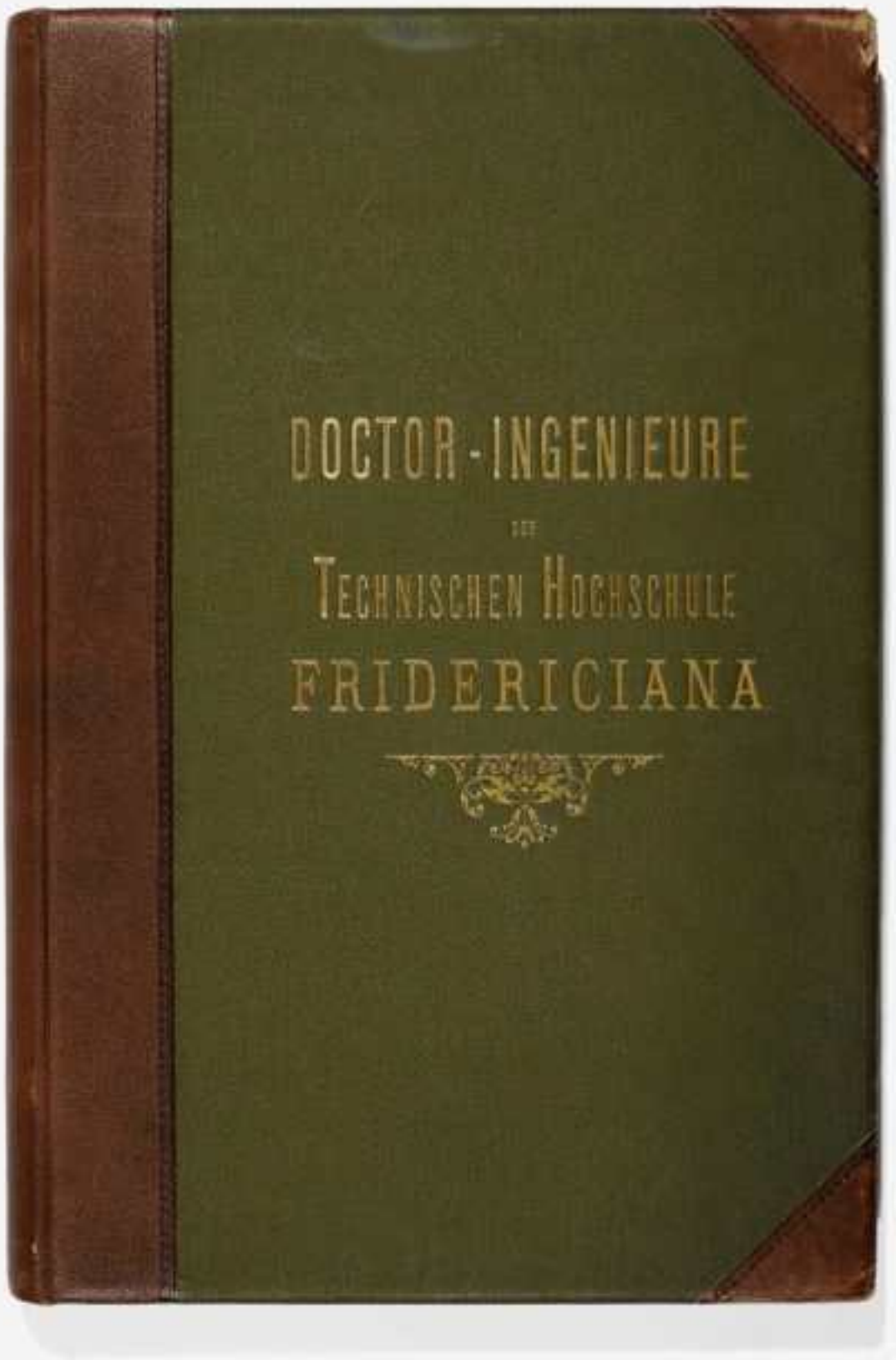


→ p.216



025 Big Book of Doctorates Awarded by Karlsruhe Polytechnic 1901–1927

→ p.217
↳ 026; 027; 030



026

Chain of Office for the Rector of Karlsruhe Polytechnic 1902

→ p.218
↩ 025
↳ 027; 030



027

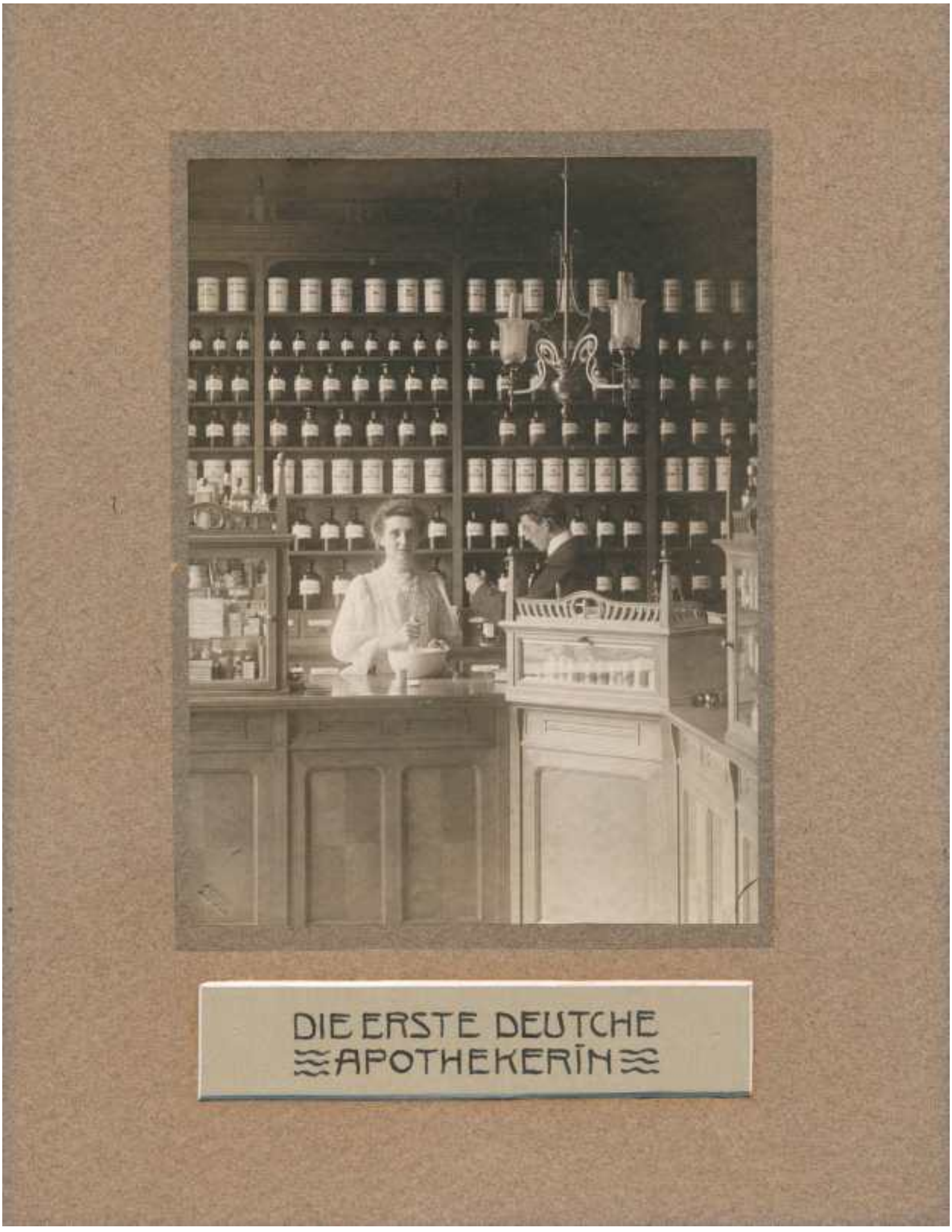
Memorial Plaque on the Bestowal of the Epithet “Fridericiana” on Karlsruhe Polytechnic from 1902 on

→ p.218
↩ 025; 026
↳ 030



028 Photographic Portrait of Magdalena Neff 1906

→ p.219
↳ 034; 050; 053



029 Certificate of Honorary Membership for Gas Chemist Hans Bunte 1910

→ p.220
↩ 011
↳ 036; 038



030 Professorial Robe at Karlsruhe Polytechnic ca. 1961

→ p.222
↩ 025; 026; 027
↳ 074



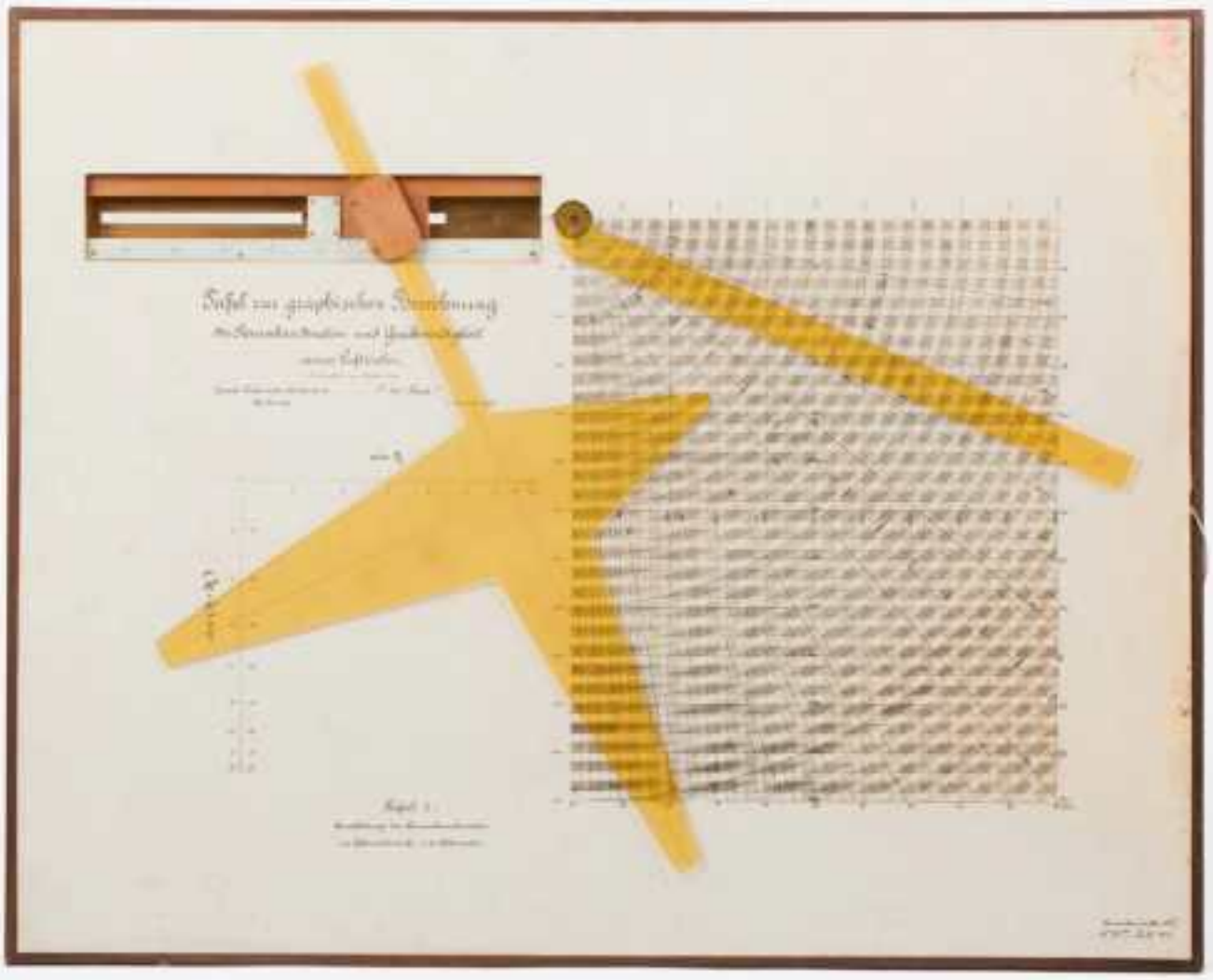
031 Beer Stein 1913

→ p.222
↩ 013



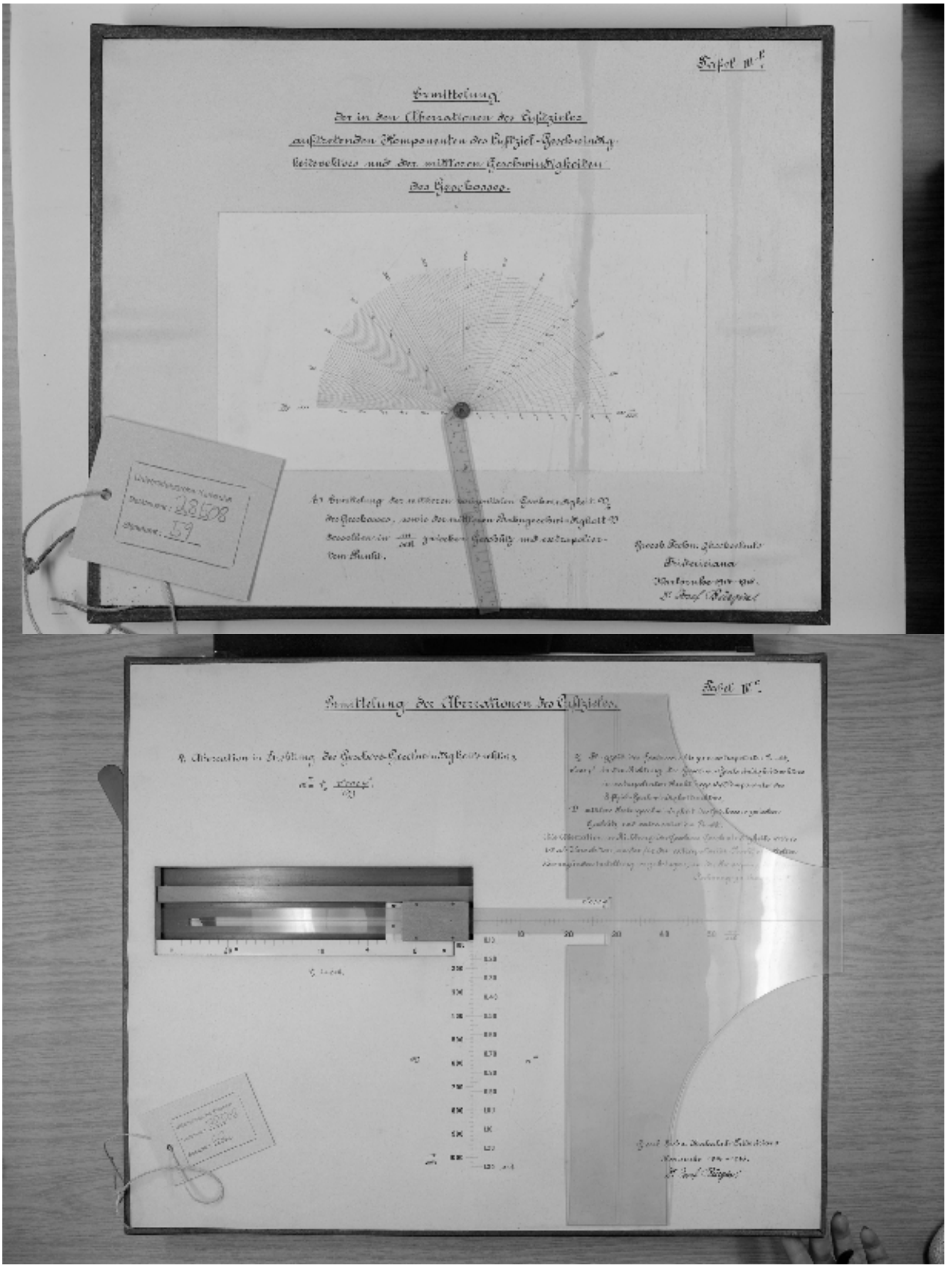
032 Calculation Table for Anti-Aircraft Fire 1915

→ p.224
↳ 045; 049; 050



Calculation Table for Anti-Aircraft Fire 1915

→ p.224
↳ 045; 049; 050



033

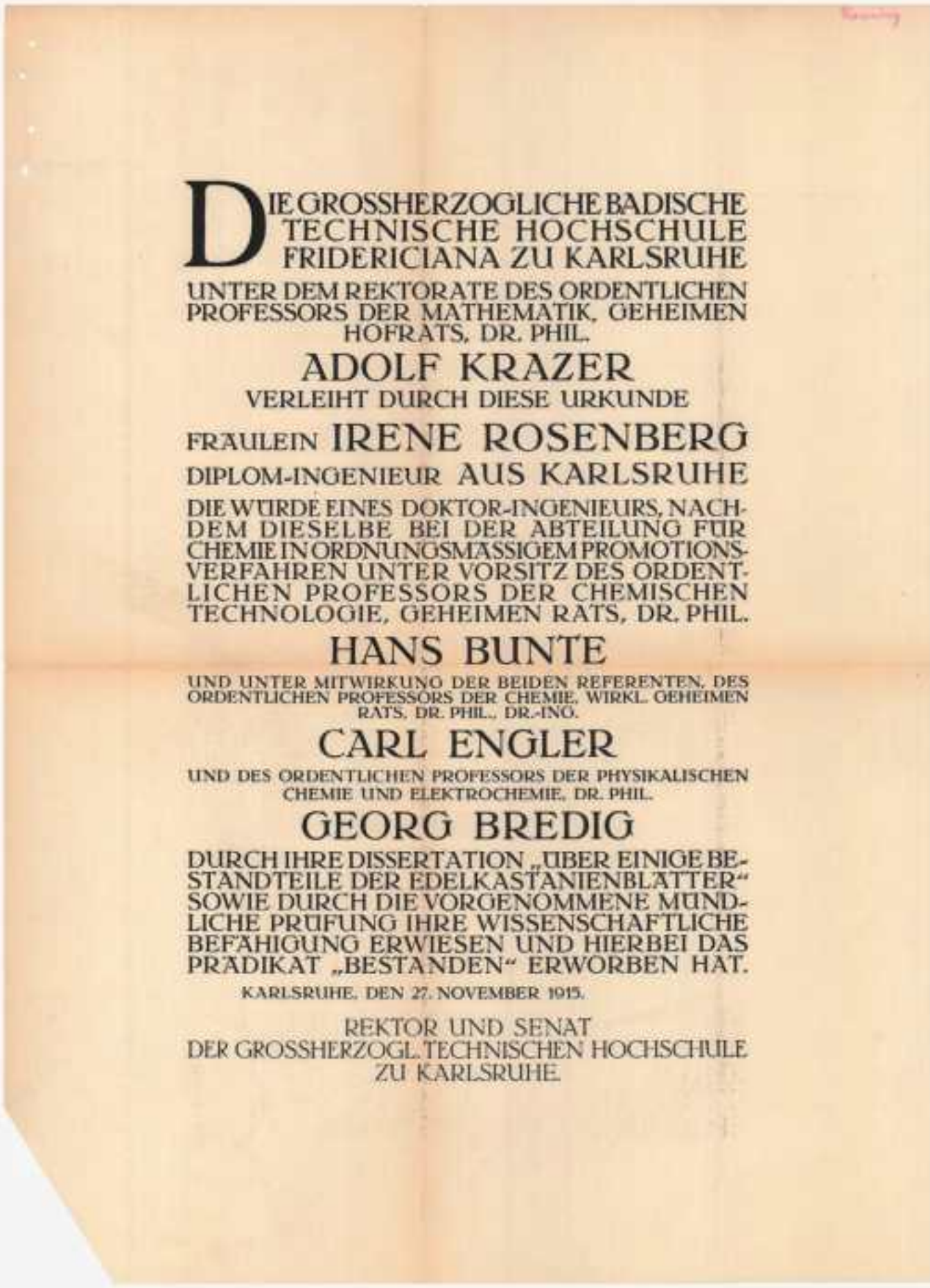
Fritz Haber as a Gas Warrior from 1915 on

→ p.241
↳ 036; 095; 096



Doctoral Certificate of Irene Rosenberg 1915

→ p.241
↩ 028
↳ 050; 053



DIE GROSSHERZOGLICHE BADISCHE
TECHNISCHE HOCHSCHULE
FRIDERICIANA ZU KARLSRUHE

UNTER DEM REKTORATE DES ORDENTLICHEN PROFESSORS DER MATHEMATIK, GEHEIMEN HOFRATS, DR. PHIL.

ADOLF KRAZER

VERLEIHT DURCH DIESE URKUNDE

FRÄULEIN IRENE ROSENBERG

DIPLOM-INGENIEUR AUS KARLSRUHE

DIE WÜRDE EINES DOKTOR-INGENIEURS, NACHDEM DIESELBE BEI DER ABTEILUNG FÜR CHEMIE IN ORDNUNGSMÄSSIGEM PROMOTIONSVERFAHREN UNTER VORSITZ DES ORDENTLICHEN PROFESSORS DER CHEMISCHEN TECHNOLOGIE, GEHEIMEN RATS, DR. PHIL.

HANS BUNTE

UND UNTER MITWIRKUNG DER BEIDEN REFERENTEN, DES ORDENTLICHEN PROFESSORS DER CHEMIE, WIRKL. GEHEIMEN RATS, DR. PHIL., DR.-ING.

CARL ENGLER

UND DES ORDENTLICHEN PROFESSORS DER PHYSIKALISCHEN CHEMIE UND ELEKTROCHEMIE, DR. PHIL.

GEORG BREDIG

DURCH IHRE DISSERTATION „ÜBER EINIGE BESTANDTEILE DER EDELKASTANIENBLÄTTER" SOWIE DURCH DIE VORGENOMMENE MÜNDLICHE PRÜFUNG IHRE WISSENSCHAFTLICHE BEFÄHIGUNG ERWIESEN UND HIERBEI DAS PRÄDIKAT „BESTANDEN" ERWORBEN HAT.

KARLSRUHE, DEN 27. NOVEMBER 1915.

REKTOR UND SENAT
DER GROSSHERZOGL. TECHNISCHEN HOCHSCHULE
ZU KARLSRUHE

035 Emergency Money Vouchers for On-campus Living 1923

→ p.242
↳ 040



036 Ammonia Synthesis Reactor 1923

→ p.242
↩ 011; 029; 033
↪ 038; 095; 096



of student amateur drama. An actor from the Karlsruhe theater was engaged to instruct volunteers who performed at
↳ 059
the *Studiobühne* before academic and city audiences. [89] A copious collection of photographs of professors at the lectern [90] and privately compiled photo documentations
↳ 058
highlight how memorable an experience it was to pursue studies at this time.

The proportion of female students at Karlsruhe Polytechnic consistently remained lower than at conventional universities. An initial peak of 9 % was immediately reached in the winter semester of 1945/46. This surge was presumably partly due to the resumption of pharmacy studies. But this was not the beginning of a steady rise in the numbers. In subsequent years, the share of female students declined again to around 5 %. The 1945 level was not reached again and sustainably exceeded until 1972. [91]

In the mid-1950s, an intensive period of new construction work began, lasting more than two decades, primarily in the area north of present-day Engesserstraße. First in line was the experimental power station designed by Egon Eiermann on current Adenauerring, completed in 1954. The addition of the Gerthsen lecture hall (1956), designed for physics demonstrations, and large lecture halls for mathematics (1959), located east of the main building on Kaiserstraße significantly increased lecture hall capacities. Students also benefited from a new sports gymnasium (1956), adjoining the stadium to the north. The 1950s saw further additions to the campus, including the Institute of Thermal Turbo-Engines (1959) and a new building for the Botanical Institute (1956), as well as botanical gardens now on Adenauerring (1958). The development of a new campus area north of Richard-Wilstätter-Allee commenced with the construction of the Institute of Soil Mechanics and Rock Mechanics (1959–1960).

The structure of Karlsruhe Polytechnic was initially streamlined by consolidating traditionally separate subjects into three main faculties. One faculty, which underwent regular changes and was consequently renamed several times, encompassed the chairs for the broad fields of mathematics, natural sciences, humanities, and economics. Until 1966, the Faculty of Building Construction existed as well, with departments for architecture, on one hand, and civil engineering and surveying, on the other, alongside the Faculty of Machine Building, which included the mechanical and electrical engineering departments. Even within this consolidated structure, significant growth occurred during the 1960s. Karlsruhe

Polytechnic, like other academic institutions in the Federal Republic of Germany, underwent continuous expansion during this period, following the recommendations of the Federal Science and Humanities Council (*Wissenschaftsrat*). Its array of subjects broadened. There was a notable increase in the number of professorships in humanities, social sciences, and economics. From the winter semester of 1950/51 to the winter semester of 1966/67, the total number of full professorships at Karlsruhe Polytechnic rose from 42 to 128.

This structural expansion also had repercussions on the ongoing construction of new buildings on the north side of Engesserstraße. In addition to the prominent physics high-rise with its adjoining flat building (1968), these developments included the Institute of Communications Engineering and Communications Transmission (1961), and new buildings for electrical engineering, including the High Voltage Institute and the Light Technology Institute (1961), as well as the Institute of Organic Chemistry (1965). The northern two chemistry towers, along with the flat chemistry building (1968), an extension for the cafeteria (1966), and the Polytechnic's high-rise library building (1966) were also constructed during this period. On Kaiserstraße, between Durlacher Tor and the main building, the civil engineering tower (1963), the elevated Wilhelm Nußelt lecture hall — since replaced by the Mechatronics Learning and Application Center — and the mechanical engineering tower (1962) were built. Diagonally opposite the architecture building on Englerstraße, the mathematics collegiate building (1962) was erected. Further development on campus continued within the Adenauerring with the construction of the Institute of Mechanical Process Engineering north of the Studentenhaus and the buildings for the Institute of Technical Thermodynamics north of Richard-Wilstätter-Allee, the Institute of Measurement and Control Technology, and the Machine Laboratory (all 1962). The Engler-Bunte Institute complex, built here between 1961 and 1962, gave this new campus area its name: Engler-Bunte-Ring. To the east of this area, on the other side of Adenauerring, the Civil Engineering collegiate building and the adjacent testing hall for concrete construction materials were built in 1970.

The redesignation of Karlsruhe Polytechnic from a *Technische Hochschule* to *Universität Fridericiana Karlsruhe* [92] in 1967 was not accompanied by any significant structural changes at that specific point in time. One motivation for this nominal upgrade was the ongoing expansion of academic disciplines, which had begun earlier and continued on thereafter. Another factor was the desire for a name that

would be easily translatable into other languages. [93] The idea, addressed now and then that the redesignation to a university had become possible solely by virtue of an expansion into the humanities at that time is unconvincing, given the modest volume of growth in this field. In philosophy, sociology, history, and literature, the teaching staff grew from two associate professorships to five full professorships between the winter semester of 1955/56 and the winter semester of 1967/68. [94] In economics, the number of full professorships increased from two to six prior to the redesignation. [95] In the overall context of the university, which then counted 125 full professorships, these subjects were hence not decisive.

In addition to the overall growth, another factor contributed to the expansion of Karlsruhe Polytechnic. The founding of Karlsruhe Nuclear Research Center in 1956 led to the creation of numerous new professorships, particularly in physics, chemistry, and mechanical engineering. Leading scientists recruited for the Center were offered, in addition to their privately legally binding employment contracts as institute heads, a professorship with teaching duties at Karlsruhe Polytechnic and the opportunity to establish a new institute there. Although such institute pairs could share the same name and function as a cohesive unit, they remained legally and financially separate. This unique dual role for leading scientists became known as the “Karlsruhe model,” distinguishing it from other forms of university affiliation in externally sponsored research. Such collaborative connections between the Nuclear Research Center and the Polytechnic did not pave the way for the founding of KIT over half a century later. Differences in governance and legal structures remained significant barriers. Even when an attempt was made in the late 1960s to merge the computing centers of the Nuclear Research Center and the university, [96] the worked-out plans failed due to legal hurdles. Nevertheless, the coexistence of the Nuclear Research Center and Karlsruhe Polytechnic proved mutually beneficial. The Center relied on a steady influx of young scientists, while students gained early exposure to professional research through hands-on experience. This synergy was evident in the number of doctoral theses coming from the Center. Typically, doctoral students conducted experimental research on site. By the late 1960s, around one hundred doctoral students from the Polytechnic had earned their degrees with research that they had completed at the Center. [97] The physics tower, built on the university campus in 1968, is another clearly visible symbol of

this collaboration, as it was designed to accommodate the new institutes established through the Nuclear Research Center.

As the number of academic chairs and institutes grew, their tasks became increasingly specialized and teaching and research diverged and required a higher degree of cooperation. Individual contributions were part of a more complex framework of scientific findings, making them harder to assess in relation to other achievements and developments. The trend shifted toward teamwork in research groups and large collaborative projects.

Professor Egon Eiermann (1900–1970), by contrast, had risen to prominence as a star architect in the postwar era and was known beyond his discipline as a unique designer. His landmark buildings, including the German Pavilion at the 1958 World Exhibition in Brussels, the German Embassy in Washington, the rebuilt Kaiser Wilhelm Memorial Church in Berlin, and the high-rise parliament building in Bonn, famously nicknamed “Langer Eugen,” symbolized the new beginning of the Federal Republic of Germany.

↳ 054

Informatics – A New Discipline Emerges

The appointment of physicist Karl Steinbuch (1917–2005) to the Chair of Communications Engineering and Communications Transmission in 1958 marked a turning point in the technical portfolio of Karlsruhe Polytechnic. The establishment of electronic data processing, thus initiated, can be seen as a pivotal factor in the university’s subsequent substantial growth, without which Karlsruhe would have been relegated to the margins of the academic landscape. Initially, though, it was not yet foreseeable that it would become the information technology focus it would later assume at KIT. The new discipline had its beginnings in the 1940s with the experimental construction of programmable computing systems. Computer pioneer Konrad Zuse started his work as a solitary inventor in his parents’ living room in Berlin. After the war, the initiative for computer design shifted equally to scientific institutions and industry. At the Stuttgart-based company Standard Elektrik Lorenz (SEL), Steinbuch worked on the construction of early data processing systems, including the ER 56, Europe’s first fully transistorized computer, hence no longer operating with electron tubes. In Germany, early centers of data processing research emerged primarily at Technical Universities in Berlin, Darmstadt, and

Munich, while operations in Karlsruhe were still dominated by non-electronic equipment.

Developments in data technology at Karlsruhe began along two paths almost simultaneously. In 1958 the Institute of Applied Mathematics started operating a computer of the Zuse Z 22 type, which was still tube-based. It had been acquired for calculating flow processes along aircraft wing surfaces. Karl Nickel (1924–2009), the research assistant responsible for computer operations, recognized the opportunities offered by this entry into data processing. He not only used the computer to pursue project goals but also offered programming lessons for students. By the early 1960s, this evolved into an unofficial proto-computing center, providing programming courses and scientific computing services for the Polytechnic's institutes. This first computer was followed by the transistorized Zuse Z 23. The computing center was operating around the clock by then, and the Z 23 was upgraded with an expensive core memory extension. After relocating to the basement of the new collegiate building for mathematics, an Electrologica X8 was put into service. Employees of the computing center developed a multi-user system called Hydra. Users from various institutes on campus were allowed to connect to the central processing unit via terminals. At the Institute of Communications Engineering and Communications Transmission, Steinbuch had acquired an ER 56. However, technical advancements soon rendered this early transistor computer obsolete. [98]

↳ 057

Steinbuch's major achievement during his time in Karlsruhe was in the field of neural networks and learning systems. Under his guidance, an apparatus was built by 1960 that was capable of being trained to recognize characters. Steinbuch was fascinated by the new field of cybernetics that had emerged in the postwar period, which describes world processes as a more-or-less complex structure of control loops. His ambition led him to plan the establishment of a Department of Cybernetics at the polytechnic. The mere notion of elevating cybernetics to the status of a central scientific paradigm would have disrupted the established cooperating scheme of the disciplines, pushing the project beyond feasibility. Even in the relatively optimistic expansionary planning of the time, it proved impossible to gain the necessary approval for such a project at Karlsruhe. Following this setback, Steinbuch gradually distanced himself from his original area of expertise and shifted his focus to high-profile contributions to futurology and criticism of the information

↳ 056

society. As an author of popular works, he produced several bestsellers and gained recognition outside academic circles.

Meanwhile, Karlsruhe University had shifted its focus on information technology in a direction that diverged from Steinbuch's emphasis on hardware engineering. Consequently, Steinbuch withdrew further from academic life. By the time of his early retirement in 1980, he had distanced himself from scientific thinking, adopting and disseminating ideas of racial biology as applied to humans. In the final years of his life, he became involved with a network of right-wing extremists. The decision to name the KIT computing center after Steinbuch after his death was reversed in 2024 after reliable evidence had confirmed indications of Steinbuch's unacceptable ideological stance. ⤳ 100 /99

In the mid-1960s, Steinbuch had attracted public attention to Karlsruhe Polytechnic due to his exceptional expertise in the field of data processing. Around this time, to be precise, in 1966, a young mathematician, Ulrich Kulisch, came to Karlsruhe to head the computing center. Kulisch recognized that the German federal government was preparing to provide substantial funding to universities as part of its data processing program. At his own initiative, he outlined the status and goals of the university's activities to the Federal Ministry of Education and Research, which led to his appointment to the commission responsible for allocating the funding. This enabled the direction of the work at Karlsruhe to be aligned with the federal funding program. Together with Munich Technical University, Karlsruhe received the largest share of this funding. In 1972, the first informatics faculty in Germany was established in Karlsruhe. In early 1969 the faculty took the intermediary step of setting up an Institute of Informatics within the Faculty of Mathematics. The creation of this institute also marked the launch of the first German course of study in informatics. In 1971, the first degrees in computer science in Germany were awarded at Karlsruhe. The chairs for informatics, made possible by federal funding, were initially based at the new institute. A key factor in the further development of informatics at Karlsruhe was continued funding by the state after the federal grant had expired. In the mid-1970s, with a new funding program launched by the federal government for applied informatics, additional professorial chairs could be established at Karlsruhe University, distributed across various faculties. ⤳ 076

Diversification of the Departmental Structure and New Organizational Framework

The year 1966 marked a significant reorganization of the university's academic structure. The previous main Faculties of Building Construction and Machine Building were divided into four main Departments: 1) Architecture; 2) Civil Engineering and Surveying; 3) Mechanical Engineering and Process Engineering; and 4) Electrical Engineering. Concurrently, the Department of the Humanities and Social Sciences was established, initially encompassing Economics as well. Further restructuring occurred in 1969, when the natural sciences, which at first had been divided into two faculties, were split up further. This resulted in the creation of separate faculties of 1) Mathematics, 2) Physics, 3) Chemistry, and 4) Biosciences and Geosciences. The same year also saw the formation of the Department of Chemical Engineering, which incorporated chairs previously associated with Chemistry and Mechanical Engineering.

The comprehensive reorganization of the faculties in 1969 occurred at the time that new fundamental regulations for Karlsruhe University had been issued. ⁄100 This most comprehensive constitution of the institution governed various aspects, including committee representation by professors, staff, and students for the university as a whole as well as for the faculties, and institutes. Since then, in research and teaching the individual institute, designated to a specific faculty, is the basic organizational unit to which chairs are tied. Significant changes were also made to the governing bodies. The office of chancellor was introduced in addition to the existing rectorship, Grand Senate, Minor Senate, and Administrative Board. The extension of the rector's term to six years marked a departure from the one-year and then two-year terms of the early postwar period, signaling a move toward more professionalized university management. It was highly likely that professors who became rectors fall behind in their disciplines during this significantly extended term of office. This led to an interest in serving several terms of office, extended continuously up to retirement age, or else followed by employment in academic management on the strength of this experience. The subsequent terms of office of Heinz Draheim (1968–1983), Heinz Kunle (1983–1994), Sigmar Wittig (1994–2002), and Horst Hippler (2002–2009, president of KIT 2009–2012) can be seen as consistent with this change.

In the winter semester of 1972/73, the number of faculties was expanded to include the Faculty of Informatics and

the Faculty of Economics. At that time, informatics and the computing center were able to move into the newly constructed building on Zirkel. By 1968, the four collegiate buildings at the Karlsruhe castle had been constructed for economics and for the humanities and social sciences. Economics had been an integral part of the curriculum since the early days of the Polytechnical College, but for much of that time, it mainly served to educate trainees in other subjects. This changed in the early postwar years with the introduction of the courses of study for technical economists and industrial engineers in the summer semester of 1948. The latter course was offered only until the summer semester of 1955 whereupon it was replaced by the technical business economics program. The course of study in political economy was established in the summer semester of 1967. The real success story, however, was the introduction of the industrial engineering degree program in the winter semester of 1969–70, which has been offered ever since. ↗[101] In terms of enrollment, this program quickly surpassed the previous frontrunners in civil engineering, mechanical engineering, and electrical engineering. ↗[102] To this day, industrial engineering remains one of the most popular degree programs at KIT.

In the postwar period, the humanities and social sciences, like economics, transitioned from being primarily a supplementary discipline for engineering education, toward offering their own dedicated degree programs. From the winter semester of 1949/50, the academic sports department contributed toward teacher training for secondary schools, leading to the emergence of a dual course of study in sports and German, often referred to as “sports philology,” which became a specialization within the Faculty of Humanities and Social Sciences. ↗[103] Over time, the number of courses of study offered expanded, including in mathematics, physics, chemistry, and geology, leading to an impressive range of study programs. A key development in the courses on offer was the transition to the awards of bachelor’s and master’s degrees as part of the European Bologna Process after 2000. ↗[104] This change also meant a shift away from the previously established engineering qualification, *Diplom-Ingenieur*. The examination taken midway in this *Diplom* program certainly was a significant milestone in the course of study but was nevertheless useless as certification. Another important innovation was the introduction of the ‘transcript of records’ issued with the bachelor’s and master’s degrees. This document lists the acquired qualifications in greater detail and transparency than the former Diplom certificate could.

Karlsruhe and the Moment of the “1968ers”

The emergence of students as a group with its own interests and political positions, associated with the year 1968, was less pronounced in Karlsruhe than at classical universities. This can be partly explained by the structure of the study programs, which were geared predominantly toward careers in industry — an object of frequent criticism elsewhere. The relatively weak emphasis on subjects in the humanities that defined the 1968 movement, especially political science, philosophy, and sociology, surely also played a role. At Karlsruhe, these subjects also figured primarily in teaching in engineering. Nonetheless, the preserved leaflets demonstrate that Karlsruhe students were about as sensitive to similar issues as their peers at conventional universities. ⁄105 For example, they viewed the career of the Karlsruhe art historian Klaus Lankheit in the military during the Nazi regime critically or questioned the intertwined private and official interests in the case of Hans Leussink, a civil engineering professor. Karl Steinbuch also became a target of student criticism. The abandonment of the tradition of donning professorial robes at the annual academic procession is additional proof of the tense atmosphere on campus, driven by concerns over public protests associated with the regalia. The generally moderate climate within the university was also influenced by the way the administration reacted to an article titled ‘Aufstand der Unmündigen’ (Uprising of the Underaged), which appeared in the newspaper *Badische Neueste Nachrichten* (BNN) in November 1968. Its author had indiscriminately lambasted students and pupils as radicals who were demanding more power at universities and preparatory schools, provoking a demonstration in protest in Karlsruhe. ⁄106 Rector Heinz Draheim responded by visiting the editorial office of the BNN to defend the students at his university. ⁄107

This moderate reception of controversial issues of the day as a characteristic of the Karlsruhe context agrees to the fact that students could be persuaded in 1970 to engage for an institutional interest. To impress upon state government the urgency of acquiring a new mainframe computer, the computing center’s management organized, in collaboration with the General Student Council (AStA), a week-long occupation of their building, along with a protest march down Kaiserstraße.

↳ 074

Although it is not possible to speak of a student revolt at Karlsruhe, an overall assessment of student contributions to the ongoing debates could well conclude that the tone of flyers and student magazines had become increasingly

↳ 079

strident from the late 1960s onward. This trend is evident not only in articles in which students were pursuing specific self-interests, but also in statements on broader political issues, which have become the guiding tone in the concert of opinions since then. However, the mere existence of flyers and similar printed materials at Karlsruhe University hardly justifies the level of distrust that the state government under Hans Filbinger harbored toward Baden-Württemberg students. In 1977, amid heightened tensions following murders committed by the Red Army Faction, a far-left militant group, the decision was made to abolish General Student Councils as official university bodies. In response, the Independent Student Council (UStA) was rapidly founded in Karlsruhe as a substitute organization stripped of its former legal authority. /108 Until the reintroduction of student councils in Baden-Württemberg universities in 2012, resentment toward the government's intervention persisted. An anonymous mocking letter from 1979, addressed to the administrative official responsible for confiscating the Student Council's assets, reflects the bitterness surrounding the dissolution of AStA at Karlsruhe.

↳ 077

The "First German Email"

On August 3, 1984, Karlsruhe University received an email according to a technical standard that marked an important step toward the transmission methods now commonly used on the Internet. Werner Zorn and his coworker Michael Rotert at the computer division of the Faculty of Informatics had connected the university to a data network predating the Internet. This put Karlsruhe's informatics in a good position to play a key role with initiatives of its own in shaping the subsequent dynamics ensuing from the introduction of the World Wide Web.

↳ 078

Pivotal Points in the University's Evolution

The four decades of Karlsruhe University leading up to the founding of KIT are dominated by a rise in the number of students from approximately 8,000 to 20,000. This growth was not, however, accompanied as in the foregoing postwar period with structural expansion corresponding to such a change in scale. This applies to staffing just as much as to the furnishing of buildings.

Around the turn of the century, with a still very unequal distribution between subjects in engineering and the

humanities, the proportion of women rose from barely 8 % in the winter semester of 1970/71 to 24 %. The very first female tenured professor was appointed in time for the winter semester of 1993/94.

Research activities developed even under the pressure of a growing teaching load. Evidence of this is a high quota of external funding sources compared to other universities and a continual incorporation of a series of new specialized research fields and graduate colleges sponsored by the federal German Scientific Research Association (DFG). ↗ 109

Structurally significant new buildings were erected, including the tower of Inorganic Chemistry (1976), the Institute of Sports (1979), and the new quarter constructed east of Adenauerring for the Faculty of Informatics (1989), the Institute of Production Engineering (1987) and the Materials Handling Experimental Hall (1999). In 2002 Karlsruhe University gained with the main auditorium building, the *Audimax am Forum*, a large auditorium that is also suitable for functions seating numerous guests. Another new building likewise completed in 2002 on Engesserstraße near the chemistry towers allowed the Institute for Chemical Technology and Polymer Chemistry to leave its quarters dating back to the nineteenth century at Ehrenhof. In the final years before the founding of KIT, the university was able to take over spaces and buildings on the premises of the former Mackensen barracks in Karlsruhe's urban district of Rintheim, which were then assigned mainly to institutes focusing on automotive technology. Thus KIT's East Campus was formed. The university library received a new extension along Engesserstrasse in 2007. It then became feasible to keep the reading rooms open 24–hours-long and expand the on-shelf selection substantially as well as meet the drastically risen demand for study desks for students on campus.

The Environmental Research Center (1997), built in combination with the General Facilities Building east of Adenauerring, signaled a new focus in scientific research. This structural development at the university, typical of the era, had its predecessors in related research initiatives on the chemistry of drinking water at the Engler-Bunte Institute, the incorporation of ecological aspects of water management in civil engineering, and research on forest dieback in botany. ↗ 110

After the establishment of informatics and economics in the early 1970s, the handover of pharmacy studies to the University of Heidelberg, effectuated in 1974, could be regarded as a compensatory move. ↗ 111

The Center for Functional Nanostructures, erected jointly with Karlsruhe Research Center with funding by the DFG in 2001, was a milestone in strengthening the emphasis on materials science in the subject profile of the university and later KIT. [112]

The Center for Applied Legal Studies was established at Karlsruhe University in 1998 as part of the informatics faculty, to focus on the problems confronting an information society and an information economy in particular.

International cooperations were an integral part of Karlsruhe University's profile going back to the 1960s. The first foreign relationship was institutionalized in 1960. It was a partnership with one of the *grandes écoles* in France, the *Institut National des Sciences appliquées de Lyon*. The University of Technology in Budapest followed in 1970, and the Gdańsk University of Technology in 1982. A few years later cooperations were agreed with the Kasetsart University in Bangkok, as well as with the University of Science and Technology in Kunming, China. As of 1989 Karlsruhe University became a member of Eucor, the European Confederation of Universities in the Upper Rhine Region. [113] The cases mentioned here are merely a selection from a broad range of other collaborations.

The proportion of foreigners among the student body fluctuated around 10 % in the 1970s. The International Department, operating since 1998, offered an additional course of study in English for fee-paying students from abroad. A separate dormitory was established especially for them.

KIT's activities involving innovation were developed not least through the university's regular participation at the industrial trade fair, the Hannover Messe, since 1978. [114] The Research Center for Information Technology (*Forschungszentrum Informatik*), in existence since 1983, was created as a separate institution from the university with the purpose of facilitating the transfer of scientific findings into practice. The expertise of members of the university in developing application solutions is made available here to companies and public institutions. [115]

Karlsruhe University had already established itself among Germany's leading technical universities before the KIT idea was born. This is evidenced more revealingly than many an indicative characteristic by the fact that since 2006 it has been a member of the institutionalized alliance, *TU9 German Universities of Technology e.V.*, a consortium of nine leading Technical Universities in Germany, and that its first presidency came from KIT. [116]

The Other Half of the Whole: Karlsruhe Research Center

Motivation and Structure

Karlsruhe Research Center, which merged with Karlsruhe University to form KIT in 2009, was established in 1956 as an independent large-scale research institution focused on nuclear research. During the mid-1950s, the Federal Republic of Germany sought to catch up with the other major industrialized nations both technologically and economically. The availability of nuclear energy was seen as an indispensable precondition for competitive economic development of the nation, fueling what was often referred to as the "nuclear euphoria" of the time. This movement gained international momentum following the International Conference in Geneva on the Peaceful Use of Atomic Energy in 1954. However, the devastating impact of the atomic bombing in 1945 had sparked global fears of nuclear war posing an existential threat to humanity. ↗[117] In Germany, the government's plans for nuclear armament faced strong opposition, even among German nuclear physicists who had previously conducted research for the Nazi state. In the 1957 Göttingen Manifesto, 18 prominent German nuclear scientists refused "to contribute to the production, testing, or use of nuclear weapons in any form." They also expressed their commitment to advancing "the peaceful use of atomic energy." Otto Haxel and Karl Wirtz were among them, who later took on leadership roles as scientific manager and institute director at the Nuclear Research Center in Karlsruhe. ↗[118]

In 1946, an Allied Control Council law had imposed restrictions on scientific research in Germany. This ban extended beyond purely military projects to include high-tech research, such as in nuclear physics, as well as aircraft, rocketry, and ship building. Industrial applications of these technologies were also prohibited. The transfer of sovereignty by the Western Allies in 1955 then permitted the Federal Republic of Germany to regain its freedom to pursue research and development in these fields.

In the contentious debate over the site for a future German nuclear research center, Karlsruhe was selected in part due to its favorable location near Germany's western border, which was strategically important during the Cold War. Another decisive factor was its proximity to a technical university. Initially, a site near the village Maxau on the Rhine was considered, but due to concerns about flooding, the decision was made to situate the center in Hardtwald forest,

ten kilometers north of Karlsruhe, in the district of Leopoldshafen. At the time, public concerns had already arisen about the safety of nuclear facilities. To address these fears, the center presented its plans publicly to the surrounding communities. The municipality of Leopoldshafen ultimately agreed to host the center, despite initial reservations. ↗ 119

In its early years, the Nuclear Research Center (KFZ) was a 50:50 joint venture between industrial and government partners. The guiding principle for this partnership was to make the center's developmental research as directly commercially applicable as possible. The Nuclear Reactor Financing Company (KFG) was established as the sponsoring body, with an industrial consortium holding 50 % of the shares, the federal government 30 %, and the state of Baden-Württemberg 20 %. The largest industrial shareholders were such major companies as the electrical engineering group AEG, Badenwerk, Bayer, Deutsche Maschinenbau-Aktiengesellschaft, Hoechst, Linde, Krupp, Mannesmann, and Siemens.

Kernreaktor Bau- und Betriebsgesellschaft mbH (KBB) was established on July 19, 1956, as the executive body of the Nuclear Reactor Financing Company, with the contract signed by then Federal Minister of Nuclear Affairs, Franz Josef Strauß. This event marks the official founding of the Nuclear Research Center. Initially, the KBB operated on premises in Karlsruhe. Once construction had begun in the Hardtwald in 1957, it became clear that this innovative scientific and technological project required more funding than initially planned. When the industrial shareholders refused to increase their financial commitments, the state partners decided to fill the necessary gap in funding. To implement this, the *Gesellschaft für Kernforschung mbH* was established in 1959 as a second sponsoring body, with the federal government holding a 75 % stake and the state of Baden-Württemberg 25 %. The state's growing share and attendant influence on the center culminated in the transfer of its industrial shares to the Gesellschaft für Kernforschung mbH in 1963, under which name the Center operated thereafter. Although the name *"Kernforschungszentrum Karlsruhe"* had been in use since the late 1950s, it did not become its official title until 1978.

↩ 006

The staffing pool for this new approach to nuclear research in Germany was a group of scientists who had already worked in this field before 1945. They included members of Werner Heisenberg's former team at the Kaiser Wilhelm Insti-

tute in Berlin-Dahlem. Their reactor division, led by Karl Wirtz, had evaded the wartime attacks by relocating to a rock cellar in Haigerloch to construct a natural uranium reactor with heavy water as moderator. However, this facility never achieved criticality, meaning that it did not manage to initiate a self-sustaining chain reaction of nuclear fission. In April 1945, an American special commando advanced on the site, detained the scientists, and dismantled the reactor. After Heisenberg and Wirtz returned from temporary detainment in Great Britain, a new team formed around Heisenberg at the Max Planck Institute of Physics in Göttingen to construct another reactor. The decision to establish the Nuclear Research Center in Karlsruhe resulted in Heisenberg not wanting to accept a position there. His student Wirtz became the director of the Institute for Neutron Physics and Reactor Technology (INR) instead, founded at the Center in 1957. Under Wirtz's leadership, the Göttingen research team had already developed the design for a research reactor known as *Forschungsreaktor 1* (FR 1). ↗[120]

The INR played a central role in the design of the first nuclear reactor to be built at the Center, known as Research Reactor 2 (FR 2). One obstacle for this project was the initial lack of legal and technical guidelines. Regulations on radiation protection were developed as the construction of the first nuclear facilities proceeded, in collaboration with the members of the Center. ↗[121] FR 2 became the first nuclear reactor in Germany to achieve criticality in 1961 and was ready for operation by 1962, following the resolution of issues with the reactor tank. Initially, it had a thermal output of 12 megawatts, which was later increased to 44 megawatts, although it did not generate electricity. While this output was relatively high for a research reactor, it was low compared to later power plants. The reactor initially ran on natural uranium, which contains about 0.7 % of the fissile uranium isotope 235 (^{235}U), due to initially uncertain procurement options for uranium enriched with the fissile isotope. One consequence of the decision to use natural uranium was the adoption of heavy water as moderator. Heavy water reflects the neutrons released during nuclear fission — neutrons that are needed for further fissions — more effectively than graphite, thus facilitating a chain reaction more easily. In the later improved form generating an output of 44 megawatts, uranium enriched with 2 % ^{235}U served as the fuel. FR 2 was utilized for basic research in physics, experiments on reactor physics, nuclear fuel development, materials research, the production

of radioactive isotopes, and radiotherapy. A steady stream of visitors from the realms of science and politics all the way up to heads of state, attests to the global attraction of this research facility. [122]

Within a few years, several institutes with specialized tasks cropped up around FR 2, which was constructed at the heart of the Center's site. By 1970, the following specialized institutes had emerged around the aforementioned INR:

- the Institute of Nuclear Process Engineering (1958), headed by Erwin Willy Becker (1920–2011),
- the Institute of Radiochemistry (1958), headed by Walter Seelmann-Eggebert (1915–1988),
- the Institute of Radiation Biology (1958), headed by Karl Günther Zimmer (1911–1988),
- the Institute of Experimental Nuclear Physics (1961), headed by Herwig Schopper (*1924),
- the Institute of Hot Chemistry (1961), headed by Hans-Joachim Born (1909–1987) until 1962,
- the Institute of Reactor Components (1961), headed by Ludolf Ritz (1908–1991),
- the Institute of Radiation Chemistry (1961), headed by Dietrich Schulte-Frohlinde (1924–2013),
- the Institute of Applied Nuclear Physics (1963), headed by Karl Heinz Beckurts (1930–1986),
- the Institute of Applied Reactor Physics (1963), headed by Wolf Häfele (1927– 2013),
- the Institute of Materials and Solid State Research (1965), headed by Fritz Thümmler (1924–2022),
- the Institute of Reactor Development (1965), headed by Dieter Smidt (1927–1998), and
- the Institute of Data Processing in Technology (1970), headed by Gerhard Krüger (1933–2013).

Specialized Infrastructure

The above-named institute titles reflect the Center's primary areas of work: reactor construction and materials science; the manipulation of chemical processes involving radioactive substances; the effects of radiation on living organisms; fundamental physical research; and data processing. Data processing was integrated into the Center even before its own dedicated institute was established. At first, it was conducted at the INR, then at the Institute of Applied Nuclear Physics, where the automated recording of measurements was an essential aspect of the research. [123]

037 Voltmeter ca. 1910

→ p.243
↳ 041



038 Fractionating Column 1930

→ p.243
↩ 011; 029; 036



039 Table Knife from the Refectory ca. 1930

→ p.244
↳ 065



040

Grandstand of the Sports Stadium 1927–1931

→ p.244
↩ 035; 042
↪ 051; 075





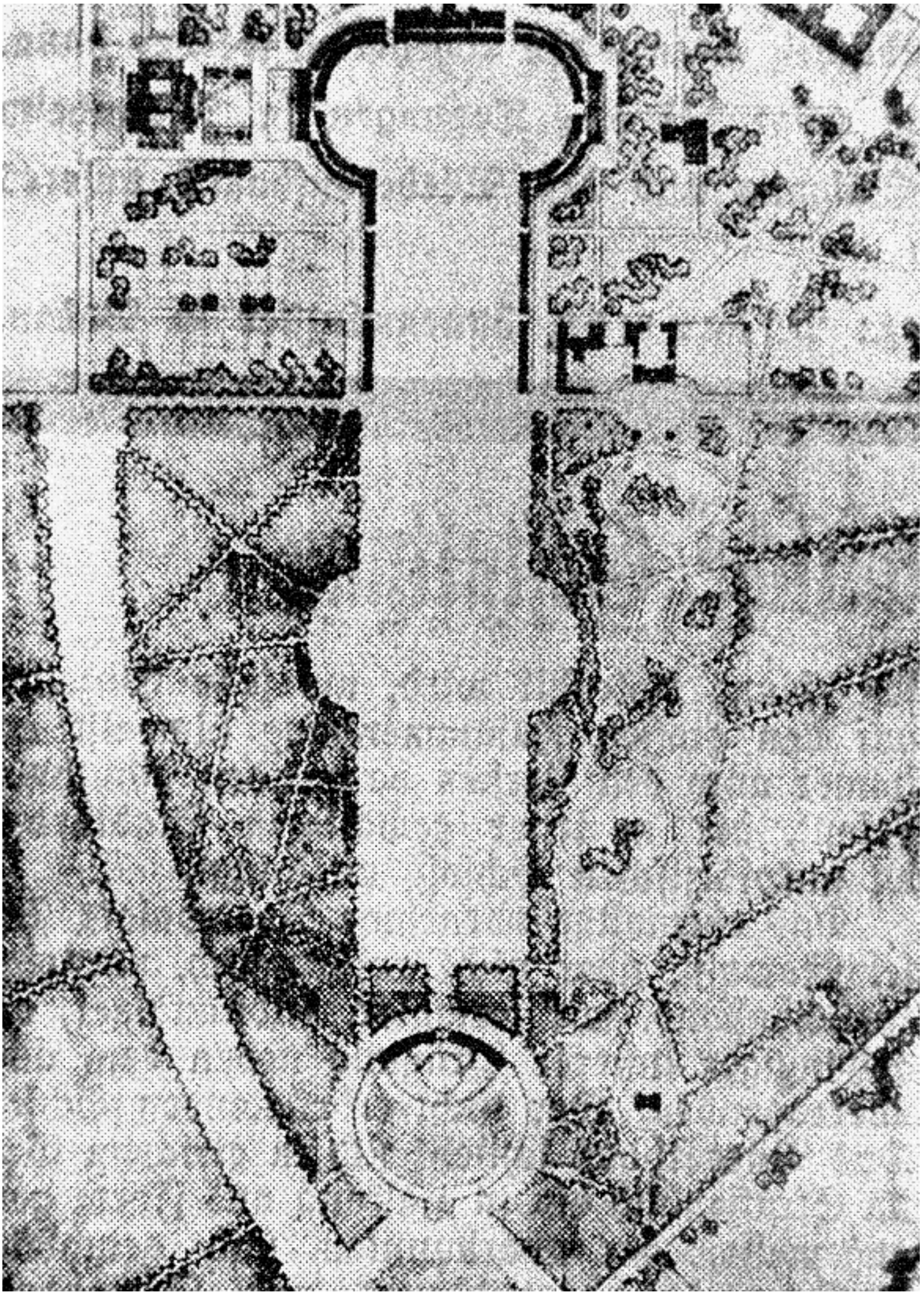
041 Sistrah Lamp design 1931

→ p.245
↩ 037



Design of a “Thingstätte” 1934

→ p.247
↩ 040



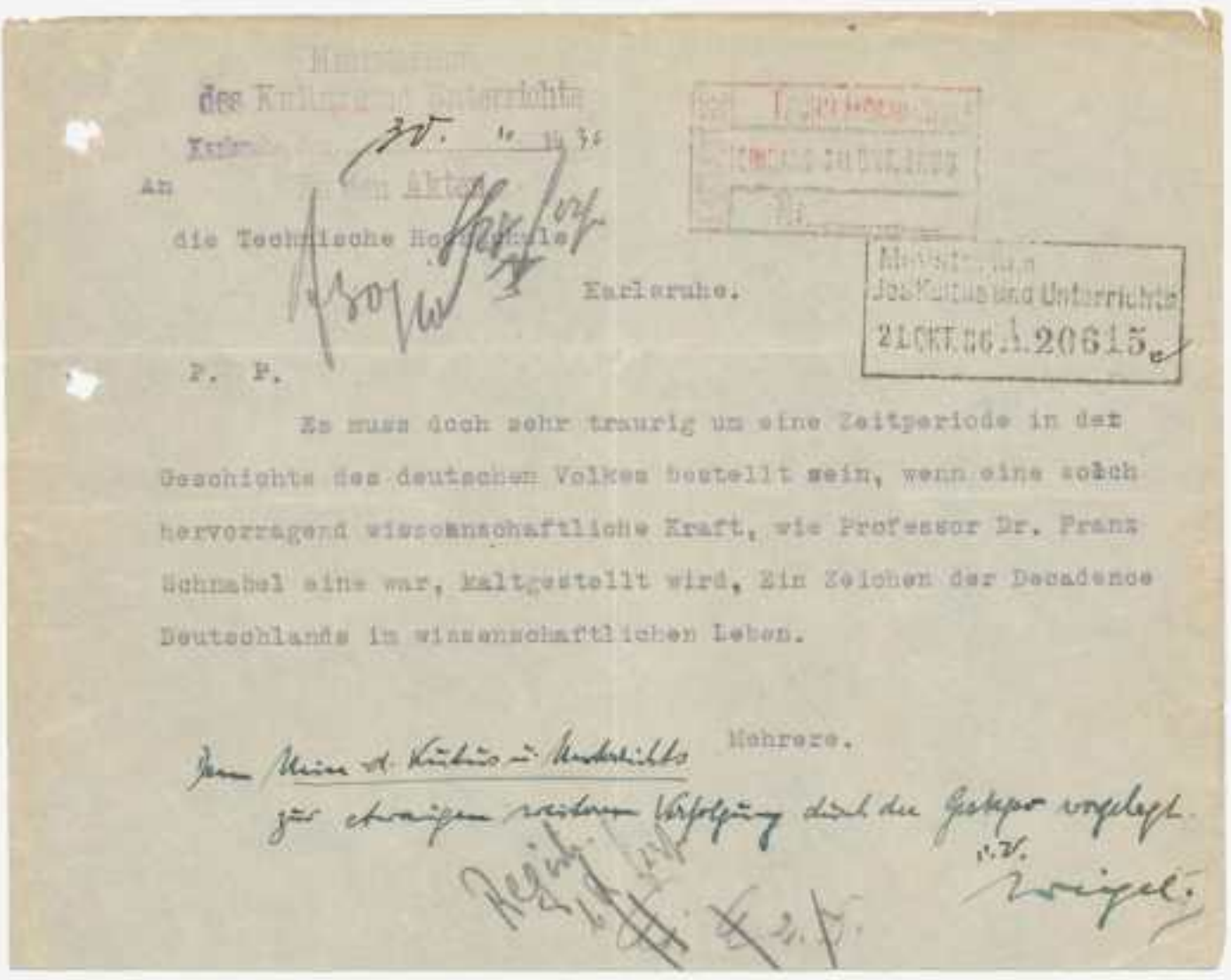
043 Sign for the Oskar Stäbel House presumably 1934

→ p.248
↳ 044



044 Protest against the Removal of History Professor Franz Schnabel 1936

→ p.248
↩ 043



des Kultus und Unterrichts

Karlsruhe, den 30. 10. 1936

An

die Technische Hochschule

Karlsruhe.

Ministerium des Kultus und Unterrichts
21 OKT. 36. I. 20615

P. P.

Es muss doch sehr traurig um eine Zeitperiode in der Geschichte des deutschen Volkes bestellt sein, wenn eine solch hervorragend wissenschaftliche Kraft, wie Professor Dr. Franz Schnabel eine war, kaltgestellt wird, Ein Zeichen der Decadence Deutschlands im wissenschaftlichen Leben.

Mehrere.

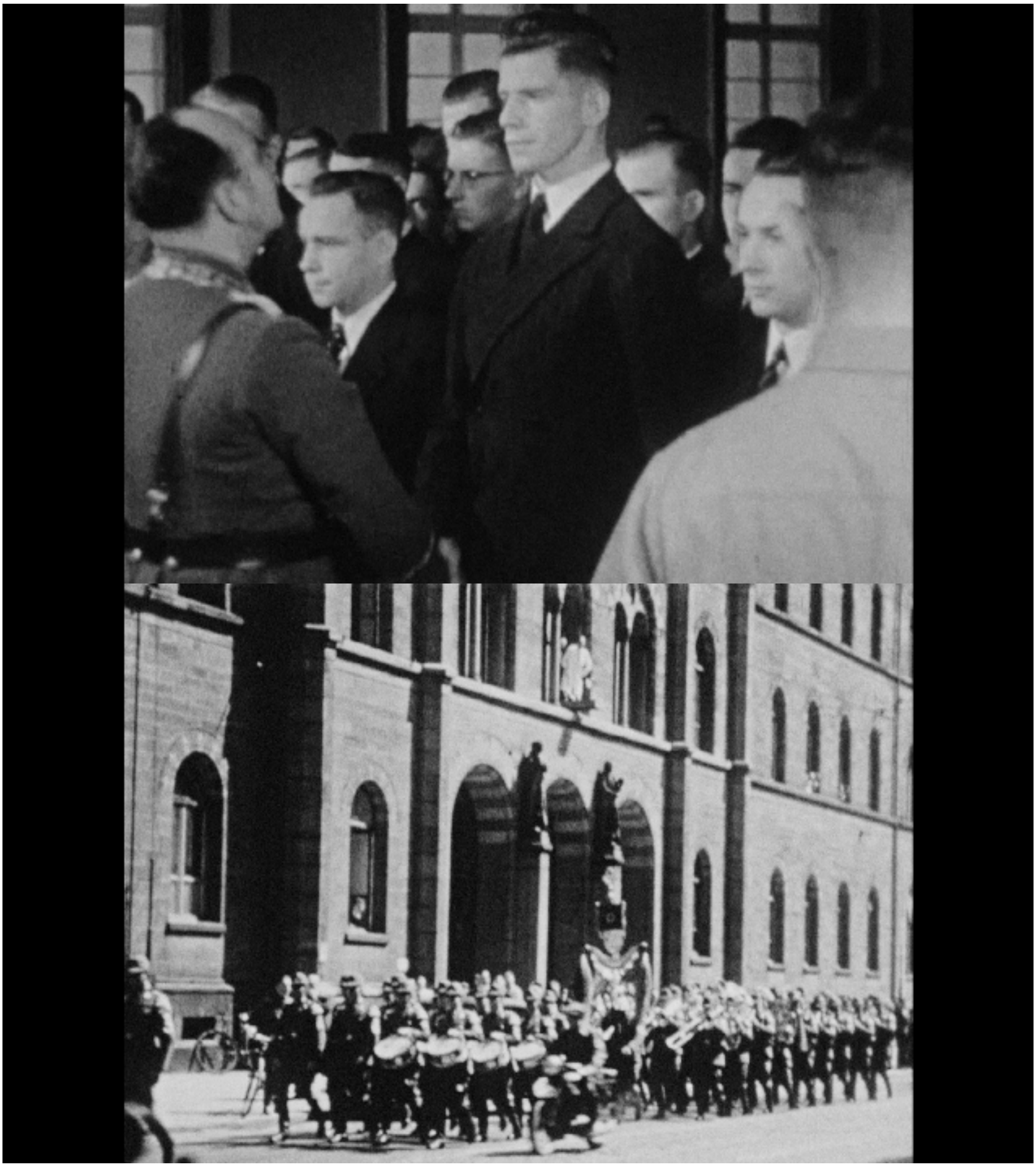
Dem Min. d. Kultus u. Unterrichts zur etwaigen weiteren Verfolgung durch die Gestapo vorgelegt.

i.V.

Weigel.

045 Promotional Film for Engineering Studies 1937

→ p.249
↩ 032
↳ 049; 050



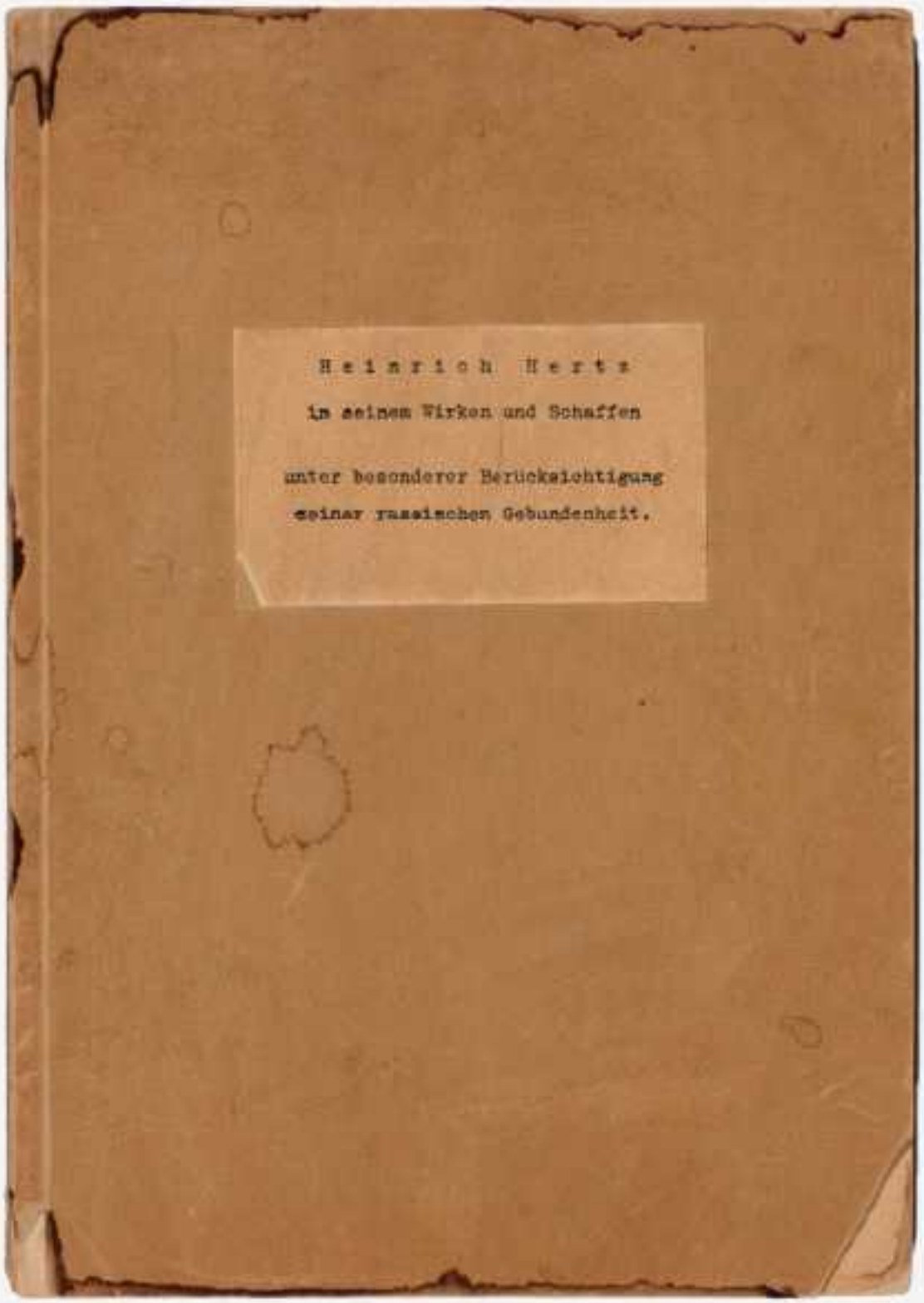
045 Promotional Film for Engineering Studies 1937

→ p.249
↩ 032
↳ 049; 050



Racist Pamphlet on Heinrich Hertz 1938

→ p.249
↩ 022



→ p.249
↩ 022

der bewegten Elektrizität, die Glimmentladung ist nicht immer diskontinuierlich, die Kathodenstrahlen bezeichnen nicht den Gang des Stromes usw."" Helmholtz schließt daraus, daß es Hertz nicht darauf ankam, durch Aufdeckung neuer, überraschender Tatsachen äußere Erfolge zu erringen, sondern sich selber durch allzeitig einwurfsfreie und dabei doch möglichst weitführende Methoden die nötige Klarheit der betreffenden Vorgänge zu verschaffen. Können wir aber nicht gerade sagen, daß dies dieselbe Art ist, die danach trachtet, etwas Bestehendes nach Möglichkeit zu verneinen, die auch den Juden Einstein eine Theorie aufstellen ließ, die behauptet, die sogenannte "klassische Mechanik" gilt nicht mehr usw., also auch ein Negatives ausspricht. Es ist dieselbe Art, die bestrebt ist, die dem nordischen Forscher eigene Anschauung durch einen mathematischen Formalismus zu ersetzen.

Unter diesen Gesichtspunkten wurde die Arbeit eingeteilt in 2 große Abschnitte. Der erste soll Heinrich Hertz zeigen, wie er, von der Maxwellschen Theorie ausgehend, mit seinen reichen theoretischen Kenntnissen als sehr gewandter Experimentator die elektrischen Wellen entdeckt. In einem zweiten Abschnitt wollen wir ausführen, wie Heinrich Hertz in seinen theoretischen Spekulationen zu einer Auffassung der Mechanik gelangt, die wir heute als eine uns artfremde ablehnen.

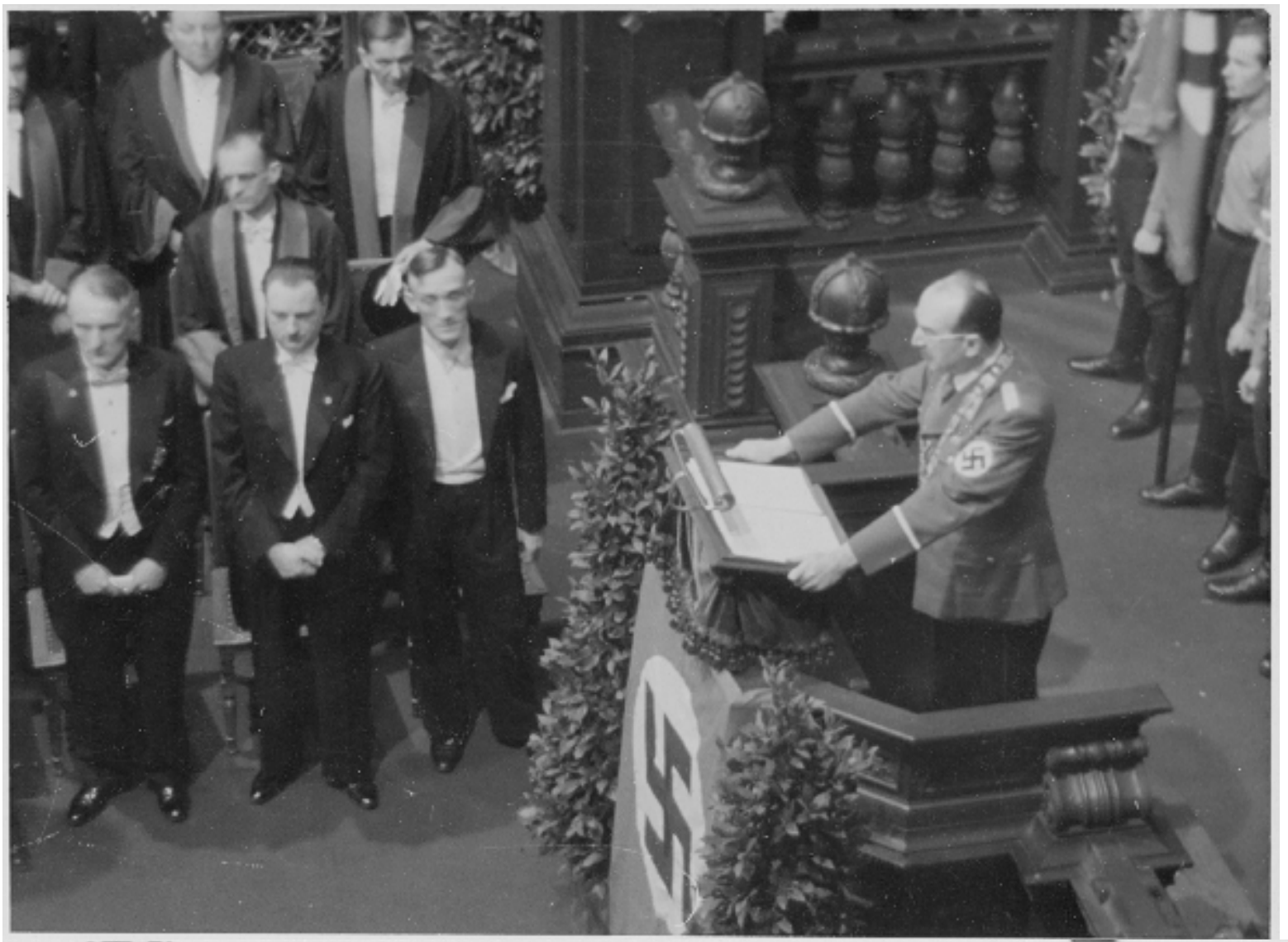
Personnel File on Professor Rudolf Weigel 1932–1972

→ p.250



047 Personnel File on Professor Rudolf Weigel 1932–1972

→ p.250





048 Instrument for Measuring Carbon Dioxide Content in Room Air 1943

→ p.250



Instrument for Measuring Carbon Dioxide Content in Room Air 1943

→ p.250



In addition, there were organizational units dedicated to radiation protection and radiation medicine, essential for the operation of a nuclear research facility. The infrastructure also included a fire department equipped to handle nuclear and chemical incidents, plant security, and specialized workshops. In 1966, a measuring mast was erected in the southern part of the site to monitor the atmosphere for radioactive contamination and to collect climate data.

In addition to the large reactors, the Nuclear Research Center also housed smaller nuclear testing facilities. One such facility was the Karlsruhe Fast Thermal Argonaut Reactor, which had an output of 10 watts and had been imported from the United States. This research device first achieved criticality in 1963 and was utilized for basic research until 1976. Today, the building, originally constructed for Argonaut, contains simulation chambers for studying the interaction of aerosols in the atmosphere. Another facility, the Karlsruhe Fast Zero-Energy Facility (SNEAK), operated from 1966 to 1985 and was used for fundamental research into breeder reactors. Its power output was a megawatt, and like Argonaut, it did not require a cooling system.

The Nuclear Research Center established its own school of nuclear engineering to train personnel both for industrial applications and for its own operations. Beginning in 1966, the Siemens SUR 100 training reactor, which had a maximum output of 1 watt, was utilized for educational purposes. This facility was dismantled in 1996.

In the pioneering days of nuclear research, a tense relationship arose between rapid acquisition of knowledge at research institutions and the time required for its conventional dissemination in scientific journals and other publications. The need for swift sharing of research results among nuclear research institutions led to a unique form of knowledge transfer. Even before findings were fed into regular publications, researchers would draft reports on their work to facilitate exchanges among scientists and institutions. The specialized literature department established at the Center was not only responsible for the regular procurement and accessibility of conventional publications but also, to a considerable degree, for the management of these internal reports. A suitably sized print shop was set up at the Center to produce these reports. Apart from exchanges at scientific conferences, the Center's reports served as a distinct pillar of its networking efforts with other research institutions. This engagement enabled the Center to participate in national

and international exchanges indispensable for scientific and engineering disciplines. Even the former Eastern Bloc swapped reports.

Patents and Licenses

Initially, the primary objective of the Nuclear Research Center was to make the results of its work suitable for industrial application. In addition to published research results for free exploitation, the Center developed a large number of original technological innovations which could be patented. The transition from research and development to commercialization occurred with the issuance of temporary licenses to use the intellectual property secured by the patents. By 2005, approximately 150 million German marks in income was earned in this way. From 1979 to the early 1990s, most of the licensing income came from reprocessing technology developed at the Center. After these licenses ran out, annual proceeds up to 2005 had consistently exceeded 2 million German marks. Alongside domestic licensing, international technology transfers had contributed significantly to the income generated from patents. ⁄ [124] In tandem with these inventions and patents, spin-off firms were founded, partly located on the Center's premises, to offer those innovations on the market.

↳ 069
↳ 090

Career Paths away from National Socialism

The first institute directors at the Nuclear Research Center had been born between 1908 and around 1925. The elder ones had been employed as young scientists at various research institutions during the National Socialist era. Karl Wirtz, Walter Seelmann-Eggebert (Institute of Radiochemistry), Alexander Catsch and Karl Günther Zimmer (both from the Institute of Radiation Biology), as well as Hans-Joachim Born (Institute of Radiation Chemistry), who worked at the Center for a brief period, had all been previously involved in atomic research or biological radiation research.

Whilst management of the sub-institutes was entrusted to individuals who had consistently engaged in research operations, the leadership of the Nuclear Research Center predominantly consisted of those whose careers had progressed to management positions during the Nazi era. ⁄ [125] The chemist Gerhard Ritter (1902–1988), who served as the technical manager at the Nuclear Research Center from 1956 to 1959, came from the chemical industry and had played a significant role in the production of poison

gas during the war. He was succeeded in 1960 by Walter Schnurr (1904–1982), who had previously worked in the German Federal Ministry of Atomic Energy. [126] During the war, Schnurr had specialized in explosives production and had managed an experimental laboratory in a sub-camp of the Auschwitz concentration camp. From 1961 to 1968, Joseph Brandl (1901–1991), a lawyer from the Ministry of Atomic Energy, served as the commercial director of the Multipurpose Research Reactor. He had been a member of the German occupying government, the *Generalgouvernement* in what is now Poland and Ukraine. In this capacity he must have been aware of the hundreds of thousands of murders committed by the Germans against the Jewish population. As the person responsible for transportation issues, he oversaw the deportation of tens of thousands of forced laborers. After being imprisoned, he evaded an imminent death sentence in Poland by fleeing and hiding for several years. [127] The lawyer Rudolf Greifeld (1911–1984), who came from the Baden-Württemberg Ministry of Economics, worked as commercial manager of the Center from 1956 to 1974. Between 1940 and 1941, he had served in the German occupation government of Paris as a war administrator, where he proposed that Jews be banned from entering night-clubs. A contact in the French civil administration documented Greifeld's inflammatory anti-Semitic speeches.

In the early years of the Federal Republic of Germany, as in this case, top positions elsewhere were often filled by individuals who had established their qualifications during the Nazi regime and leveraged contacts made during that time to advance their careers. Positions in the military, forced-labor-based industrial war production, and in weapons development had frequently resulted in complicity in, or awareness of crimes. After the war, legal prosecution largely focused on prominent leaders of the Nazi state and the gravest offenses.

To attribute the continuity among the elites who had successfully navigated through the systemic transition solely to a lack of staffing alternatives would, however, forego an opportunity to delve deeper. Such a perspective overlooks the fact that the deliberate avoidance by the early Federal Republic to confront roles performed shortly before, under National Socialism, also passes over conduct that had either contributed to the rupture with civilization or had facilitated it. Given that the Nuclear Research Center was an institution in which critical and far-reaching decisions were made, it is particularly relevant to ask how former habitual leadership styles at the top influenced its own operations. Answers to

this can make understandable the existing decision-making situations and maneuvering rooms available to the actors involved. This applies not only to KIT in retrospection about the Nuclear Research Center since 1956, but also to Karlsruhe Polytechnic under Nazism and the postwar period. Beyond the cases discussed here, the available research into the histories of both predecessor institutions to KIT still lags behind the existing possibilities.

Development and Research Focuses

Following the completion of FR 2, the research and development capacities established at the Center were applied to various other major projects in nuclear technology. The dimensions of these initiatives far exceeded the scale typical of a university. By 1960, over 1,000 people were employed at the Nuclear Research Center; this number grew to more than 3,000 in 1968. Around 1980, approximately 30 % of the workforce held a scientific degree. The Center's annual budget surpassed 100 million German marks in 1962 and exceeded 500 million marks by 1975, with the federal government bearing the largest share of the funding.

The work at the Center was basically devoted to projects justifying usage of the term "big science." The subjects of these projects were oriented toward government programs, with the ones assigned to the Center lying in the area of energy supply. Until the 1970s, nuclear energy was basically preferred by the full political spectrum as meriting support. This consensus was reflected in the federal government's four nuclear programs in total, between 1958 and 1976. The tasks defined within the framework of project research were distributed among the existing institutes and facilities at the Center, with a single organizational unit permitting multiple large projects to be undertaken simultaneously. Besides the constant elements in the Center's organizational structure — namely, the institutes, management, central administration, and infrastructure — there also existed the major projects with their own structures. They set the pulse of the Center and thus give reason to describe them separately in what follows.

Multipurpose Research Reactor

Between 1961 and 1965, the Siemens firm constructed the Multipurpose Research Reactor (MZFR) on the Center's premises. This pressurized water reactor was cooled with heavy water and initially natural uranium was used as fuel, which was later slightly enriched with 0.85 % of the isotope ^{235}U. The reactor had a thermal output of 57 megawatts and served as a study model for this type of power plant. From 1966 until its decommissioning in 1984, the MZFR supplied electricity to the *Badenwerk AG* grid and later also provided long-distance energy for the Nuclear Research Center. However, in the late 1960s, several incidents of radioactive contamination among personnel highlighted a disconnect between the public's expectations for transparency and the Center's willingness to provide information. In response, the Center sought to enhance its public relations efforts, to improve its standing amid the ongoing controversy surrounding nuclear energy.

Separating Nozzle Technology

Work on a specialized uranium enrichment process commenced in 1958 with the establishment of the Institute of Nuclear Process Engineering. Instead of using gas centrifuges for enrichment with the fissile uranium isotope ^{235}U, the institute developed the separating nozzle technique. Although this method was less suitable for militarily relevant enrichment levels of 20 % and above, it primarily offered a way to produce fuel for light water reactors, which require ^{235}U at a concentration of about 3 %. A series of developmental stages in collaboration with the industrial partner STEAG (formerly *Steinkohlen-Elektrizität AG*) led to the construction of a plant to manufacture separating nozzles on an industrial scale. A customer was found in Brazil. That country's President, Ernesto Geisel, visited the facility built at the institute in 1978. However, following delivery and initial operations, Brazil ultimately decided against permanent use of the plant. In the course of completing the project, the institute had developed a technique for the precise production of very small structures, which subsequently became the new focus of its research.

↳ 063
↳ 069

Superheated Steam Reactor

The Nuclear Research Center's work was supposed to provide a comprehensive overview of reactor types under discussion and testing at that time. This included the design and construction of a prototype boiling water reactor near Großwelzheim, in close proximity to the Kahl nuclear power plant. Known as a superheated steam reactor, this facility was designed to produce an output of 25 megawatts and was constructed between 1965 and 1969. However, commissioning had to be aborted due to a flaw in the reactor core design: fuel element cladding had overheated and ruptured. Unable to fulfill its original purpose, the plant was subsequently re purposed as a test bed for nuclear facility safety research. Investigations included, among others, studying the way nuclear facilities respond to heavy impacts, such as during an earthquake or a plane crash.

Niederaichbach Pressurized Water Reactor

The Niederaichbach nuclear power plant, located near Landshut and designed for an output of 106 megawatts, was also conceived as a prototype and constructed from 1966 onward on commission of the Nuclear Research Center. It featured a pressure-tube reactor design, with the fuel elements not arranged together in a reactor pressure vessel, but individually in pipes through which coolant circulates under pressure. The heavy-water moderator flows externally around the pressurized piping. Problems and delays arose already during the developmental stage of construction. It became apparent that this reactor type would not be able to compete with the more successful light water reactors. After its commissioning in early 1973, the plant was operated for just a year and a half to generate electricity.

Fast Breeder Reactor Project

In the early 1960s, the fast breeder reactor design appeared to be particularly promising. This reactor type offered the potential to utilize existing fuel resources over 50 times more efficiently by "breeding" additional nuclear fuel while the reactor is already running, generating new atoms by nuclear fission. The physicist Wolf Häfele led the Fast Breeder Reactor Project at the Nuclear Research Center from 1960 to 1972. Besides the innovative underlying physical conception of the reactor, one notable feature was employing sodium for the heat exchange between the reactor core and the power-gen-

erating turbine. Chosen for its excellent thermal conductivity, this light metal with a melting point of 98 °C, posed its own technological challenges due to its explosiveness when in contact with water. This breeder reactor design was first tested in the Karlsruhe Fast Zero-Energy Arrangement (SNEAK), which operated between 1964 and 1985. The construction of the compact sodium-cooled nuclear reactor plant known as KNK I started in 1966 and it operated as a 20–megawatt power reactor from 1971 to 1974. In 1975, KNK I was converted into a breeder reactor, designated KNK II. Throughout its operation from 1977 to 1994, KNK II successfully supplied electricity to the grid.

The project's primary goal had actually been to test breeder reactor technology for the SNR 300 breeder reactor near Kalkar on the Lower Rhine. This power plant was completed in 1985, at the peak of the controversy surrounding nuclear energy exploitation in West Germany and was already highly controversial while under construction. Following the Chernobyl reactor disaster in 1986, such concerns about the reactor intensified. Political decisions at both the state level in North Rhine-Westphalia and at the federal level ultimately prevented the plant from getting the permits to start operations. The stoppage of fast breeder reactor technology marked a turning point in the Nuclear Research Center's development. Long before the decision to phase out nuclear power in Germany had been taken, the shift away from breeder technology challenged the Center's original raison d'être and motivated a thematic reorientation.

Reprocessing Plant

Reprocessing spent nuclear fuel was a necessary procedural step toward utilizing the new fissile material produced during the operation of a breeder reactor. It is also used to extract fissile material from the residual burn-up of other types of reactors. The Karlsruhe reprocessing plant had been envisaged at the Nuclear Research Center in connection with the Fast Breeder project in 1965 and was built by 1970, designed for an annual throughput of 35 to 40 tons of fuel material. From 1974, work in this area was organized under the reprocessing project. The reprocessing process involved dismantling the spent and highly radioactive reactor fuel elements by remote control, dissolving the fuel pellets in acid, and physico-chemically separating the ingredients for disposal or subsequent reuse. The Center had developed separate sub-projects for the required processes, including shielded remote handling,

fuel element dismantling, nuclear fuel treatment, and containment of highly radioactive waste materials. The abandonment of the breeder reactor concept also removed a key source of demand for the reprocessing plant.

Continuity into Nuclear Fusion Research

Research into nuclear fusion at the Nuclear Research Center has continued on despite the change of heart about generating energy by nuclear fission. This involves generating energy by the same process as occurs in the sun, in which two hydrogen atoms are fused to form a helium atom. The required temperatures of many millions of degrees Celsius and the use of the radioactive hydrogen isotope tritium pose considerable challenges. Embedded in international collaborations, the Nuclear Research Center focused on various aspects of fusion technology, including fuel supply and reactor heating. The magnetic confinement of the hot plasma suspended inside ring-shaped electromagnets to create the conditions for fusion played a key role. Since 1960, the Center has maintained a research focus on superconductivity, which can be applied in designing particularly compact and powerful electromagnets. Superconducting magnets are an essential element in the architecture of a fusion reactor. Another scientific application of such aggregates is in particle-accelerator construction. The Institute of Technical Physics, established at the Center since 1978, took charge of testing the superconducting magnetic coils built for the international fusion reactor ITER in France, in a specially developed test field.

↳ 072

Basic Research in Physics

The Nuclear Research Center continuously allocated approximately a tenth of its resources to basic research not expected to have any immediate application. One primary focus was particle physics, in which the Institute of Experimental Nuclear Physics was specialized. Herwig Schopper, who later became director general of the European Organization for Nuclear Research (CERN), served as institute director from 1961 to 1973. The trajectory of its development established during this period continues to the present day. This line of research encompassed various projects, including the Karlsruhe Rutherford Medium-Energy Neutrino Experiment at the Rutherford Appleton Laboratory in Chilton, Great Britain. Another significant project was the Karlsruhe Shower Core and Array Detector Experiment, featuring an array of detector stations

on the Center's premises, generating a field for capturing particles from space. Additionally, the Center participated in the international Pierre Auger Observatory operated in Argentina, dedicated to the study of cosmic rays.

Scientific Services and Infrastructure

The Nuclear Research Center's occupation with nuclear processes created an expertise in handling tritium, a hydrogen isotope. The Karlsruhe Tritium Laboratory, established at the Center in the 1980s, has made and continues to make significant contributions to the handling of tritium as a fuel for fusion reactors. During its early days, the Center started to conduct preliminary research for the international ITER test facility. The decision to welcome the large-scale experiment to define the mass of neutrinos was also reached on the strength of advanced tritium handling capabilities developed at the Center.

↳ 085

The Karlsruhe Nuclide Chart, first compiled in 1958 and regularly updated by Gerda Pfennig (1930–2017) under Walter Seelman-Eggebert's direction at the Institute of Radiochemistry, became an essential tool for nuclear physicists.

↳ 060

Operating nuclear facilities necessitated the development of a sophisticated safety infrastructure. This encompassed atmospheric monitoring, which later evolved into the spheres of meteorology and climate research, as well as workplace radiation protection using dosimeters and measures to detect external and internal contamination. A notable innovation was the Karlsruhe Standard Brick, a lead-based shielding element designed to prevent radiation exposure from experimental setups. Security measures at the facility extended beyond conventional fencing and access controls, to include armed personnel and a canine unit. The construction of new scientific instruments often called for complicated customized solutions. Various specialized workshops fulfilled these tasks, some of which were centrally located, others were maintained within individual institutes. Consequently, the Center evolved into the region's largest provider of vocational training.

↳ 061

↳ 064

Identity

The Center's prominent role as a nuclear research facility, its location nestled within Hardtwald forest, and perhaps also the stringent security measures all contributed to fostering a unique sense of identity among its staff. They saw themselves as following in the tradition of major national research facilities, felt they were part of that community, and actively cultivated international connections at this level. This image suits their participation in the Atomiade, a series of international sports competitions held between employees of various nuclear research facilities. An in-house magazine shared personal news such as weddings, births, and deaths among what was affectionately referred to as the "reactor family."

↳ 065
↳ 068

This special sense of belonging was possibly reinforced further by small distinctively featured accessories at the Center. The broader social controversy surrounding the exploitation of nuclear energy was perceived as external pressure, which is likely to have strengthened a sense of solidarity. However, the termination of the fast breeder project and the subsequent abandonment of reprocessing technology left employees with the feeling that their life achievements had been devalued by the outside world. Little is known about how such frustrating experiences were taken. Responses ranged from bitter lamentations, to examples of creative coping or nostalgic repurposing. The power of this cultivated sense of identity is evident in the lasting loyalty of the Center's employees to their own orchestra even after the founding of KIT. ⁄ 128

↳ 066
↳ 097

Thematic Evergreens and Novel Research Areas

By the time KIT was established in 2009, the focus of the Nuclear Research Center had shifted so drastically that only a small portion of its work was still dedicated to nuclear technology. This transformation had been officially recognized in 1995 when the Center was renamed *"Forschungszentrum Karlsruhe – Technik und Umwelt"* (Karlsruhe Research Center – Technology and Environment). This rebranding coincided with the tenure of the physicist Manfred Popp as chairman of the board. Popp's primary mandate was to redesign the institution, adapting it to new scientific and societal needs. One new area of development during his term was medical technology, for instance, including the creation of a robot for microsurgery.

↳ 071

Precautionary Measures against Malfunctions

The Nuclear Research Center's research profile initially included projects aimed at enhancing nuclear facility safety. This focus was intensified following significant incidents such as the Three Mile Island reactor accident near Harrisburg in the United States in 1979 and the Chernobyl disaster in 1986. The goal was, to make such events more manageable by developing robust containment structures for reactor shells capable of containing a melted reactor core. Extensive test series were conducted at the Center to this end. The Concrete Crucible Test Facility (BETA) was used to assess the resistance of concrete structures against a simulated molten reactor core. Another key safety research project focused on developing a reactor shell that could withstand hydrogen explosions expected in the event of a reactor accident. In addition, filter systems were developed at the Center to be able to retain radioactive substances in exhaust air at nuclear facilities.

Waste Disposal

Research into nuclear waste disposal, initiated in the early days of the Nuclear Research Center, has continued to the present day at KIT. This ongoing work involved evaluating various basic concepts that have evolved over time. In the Asse experimental permanent repository near Braunschweig, the deep storage procedures for nuclear waste were tested. Radioactive leakage revealed the inadequacy of this solution. The Act on the Search and Selection of a Site for a Repository for High-Level Radioactive Waste was passed soon afterwards, marking a fundamentally new approach to the problem. The Center had been providing scientific input on developing repository planning. It thereupon started developing technology for conditioning and packaging nuclear waste. A notable achievement in this regard was the development of a vitrification plant designed to bind highly radioactive concentrated waste from reprocessing plants into a glass matrix and to fill it into containers suitable for final disposal. Since the turn of the millennium, these activities have been consolidated under the Institute of Nuclear Waste Disposal.

↳ 089

Systems Analysis and Technology Assessment

The current Institute of Technology Assessment and Systems Analysis (ITAS) at KIT evolved out of the evaluation of nuclear reactor designs. ITAS underwent several stages of development, beginning in the late 1950s with the research by systems analyst Helmut Krauch (1927–2010) at Karlsruhe Nuclear Research Center. In 1975, a part of the study group for systems research that Krauch had established at Heidelberg University was integrated into the existing Institute of Applied Systems Engineering and Reactor Physics at the center. This group later developed into the independent Department of Applied Systems Analysis, which was eventually transformed into ITAS in 1995. Today, this institute also oversees the Office of Technology Impact Assessment at German Federal Parliament and provides systems-analytical support for research projects aimed at developing future-oriented, climate-friendly technologies.

↳ 090

Materials Science

The Institute of Materials and Solid State Research initially focused on studying the behavior of reactor materials under radiation exposure. A center of excellence in this area emerged as a result before materials science, which primarily evolved from metallurgy, had even achieved its current thematic breadth. While addressing typical issues in materials science, the institute also accommodated more unconventional research in the 1980s, notably bionics. The physicist Claus Mattheck became head of a Department of Biomechanics set up at that institute in 1985. Mattheck developed a simple technique to enhance the strength of component joints derived from observations of both animate and inanimate natural objects: the method of tension triangles. The institute's scope in materials science expanded significantly with the establishment of the Center for Functional Nanostructures. It represented a collaboration between Karlsruhe Research Center and Karlsruhe University with funding by the German Scientific Research Association (DFG) from 2001 to 2014.

↳ 070

Climate Research

The Nuclear Research Center's need to monitor atmospheric radionuclides led to the development of a focus on weather and climate measurement. At the Center's initiative, the bold step was taken in 1985 to establish the Institute of Meteorology and Climate Research (IMK) as a joint venture with Karlsruhe University's Meteorology Institute. Unlike earlier institute cooperations that maintained clear boundaries between center and university entities united by virtue of the person in charge, ↗ 129 the IMK's structure anticipated the integrated model later adopted by KIT.

The IMK collaborated in the tri-national Regio-Klima Project for documenting the climate in the Upper Rhine Rift Valley, which produced the regional climate atlas, *Klimaatlas Oberrhein*. In the mid-1990s, the section of the institute belonging to the Karlsruhe Research Center gained recognition for its measurement flights documenting the ozone hole. ↳ 073 The satellite-mounted MIPAS spectrometer for measuring trace gases in the Earth's atmosphere is also attributable to the same sponsorship. In 2002, the IMK was expanded to include the Institute of Atmospheric Research in Garmisch, ↩ 007 which now comprises the KIT Alpine Campus.

Alternative Energy Sources

Latest by 1973 the oil crisis heightened awareness of the supply risks and finite nature of fossil fuels, spurring efforts to find alternative energy sources in diverse projects at the Karlsruhe Research Center. The Institute of Neutron Physics and Reactor Technology applied its expertise in handling hydrogen, which it had originally developed for nuclear engineering purposes, to pioneer early experiments in a hydrogen-powered electric vehicle. The prototype bioliq® plant for ↳ 067 the production of biofuels for combustion engines from biogenic raw materials was also developed. This project was initiated in the years leading up to the founding of KIT.

Karlsruhe Research Accelerator

The Karlsruhe Research Accelerator (*Elektronen-Synchrotron Angströmquelle Karlsruhe*) began operations in 2003, during the time of the Karlsruhe Research Center. This electron synchrotron consists of a storage ring with a circumference of 110 meters, which stores electrons at an energy level of 2.5 gigaelectron volts. A superconducting magnet makes it possible to generate an exceptionally well-focused electron

beam. Straight beamlines extending from the storage ring divert the synchrotron radiation for various applications. Their range spans from fundamental physical research and materials science, to the investigation of the smallest structures, as well as X-ray lithographic production processes.

Integration into the Helmholtz Association

Steps toward collaboration between external institutions involved in then-novel big science were already taken in 1958, with the establishment of a working committee to address administrative and operational issues at German reactor sites. From the outset, the Nuclear Research Center was part of this structure, which initially focused on exchanging experience regarding operational management and safety. In 1970, the Association of German Large-Scale Research Facilities (AGF) was founded. In this new form, the participating centers maintained their independence in mutual interactions. Further development occurred with the establishment of the Helmholtz Association of German Research Centers (HGF) in 1995. The HGF introduced a more centralized governance structure, including a senate, a president, and a committee of donors, alongside the general assembly. With this structure, binding resolutions can be passed for individual members. Since then, the HGF has provided the institutional framework for program-oriented funding, with the areas of research defined in consultation with the funding federal and state institutions. Helmholtz Centers must compete with one another for program-oriented grants, which are currently allocated on a seven-year basis.

KIT

The idea to found the Karlsruhe Institute of Technology (KIT) arose in a competitive context. German universities were invited to apply for funding in the mid-double-digit million range, along with the prestigious title of "University of Excellence," as part of the first Excellence Initiative by federal and state governments. Karlsruhe University determined that its initial draft proposal would not be competitive enough in this highly selective process. This led to the idea of merging the university with the Karlsruhe Research Center, building on their existing structural ties and ongoing collaborative projects. However, the exact objectives of the merger, which culminated in the founding of KIT in 2009, were not fully clear at the outset. One significant obstacle was the issue of joint sponsorships by the federal and state governments, which posed legal difficulties due to constitutional constraints. The complete merger was only finalized by the later partners in negotiations with their sponsors after the merger proposal had already won the Excellence accreditation in 2006.

The merger created a unique combination in Germany of a large-scale research institution primarily funded by the federal government, and a state university. Despite the different legal frameworks tied to federal and state sponsorships, the diverse responsibilities of the predecessor institutions are now met within a single entity. The state university's mission, within the constitutionally required freedom in research and teaching, is complemented by the thematically committed big science agenda under the auspices of the Helmholtz Association of German Research Centers, with the mandate of program-oriented funding. This consolidation of diverse tasks has also opened up new opportunities. Students benefit from the involvement of more scientists engaged in big science offering courses at the university. Likewise, the large-scale research projects themselves provide students with opportunities for hands-on scientific training and thus professional qualifications. KIT scientists enjoy enhanced opportunities for interdisciplinary exchange and collaboration.

The core aspects of the KIT merger included the establishment of central governing bodies, such as the Supervisory Board, the Presiding Board, and the KIT Senate. KIT's disciplines are organized into the main areas: 1) Biology, Chemistry and Process Engineering; 2) Informatics, Economics and Society; 3) Mechanical and Electrical Engineering; 4) Natural and Cultivated Environment; and 5) Physics and

Mathematics. Within these divisions are the faculties (departments) and the integrated Helmholtz research programs as recipients of program-oriented funding. Institutes tasked with big science are thematically aligned with ones fulfilling university duties and operate side by side. The merger led to a bundling of resources, which improved the academic infrastructure, particularly benefiting the library and the computing center. The computing centers of both parties were unified in 2008, even before KIT was officially founded.

At the founding of KIT, the decommissioned nuclear facilities — including Research Reactor FR 2, the Multipurpose Research Reactor, the reprocessing plant, and the storage facility for radioactive waste — were spun off into a separate entity. This operational area was transferred to a nuclear waste disposal company, *Kerntechnische Entsorgung Karlsruhe GmbH*, which is indirectly sponsored by the federal government.

According to a law passed by the state of Baden-Württemberg on the merger of Karlsruhe University and Karlsruhe Research Center into the Karlsruhe Institute of Technology, KIT is both a public corporation with legal capacity and a state entity. Whereas the state finances KIT's university-related activities, the institution must secure part of its budget for large-scale research through applying for program-oriented funding within the framework of the Helmholtz Association. A significant additional portion of its receipts comes from other sponsors.

In the winter semester of 2024/25, KIT had 22,761 registered students, with 29.9 % of them being women, and 23,1 % coming from abroad. The institution is home to 415 professorships and employs a total of 10,107 staff members. In 2023 the annual budget totaled 1.15 billion euros, with 487 million euros generated from third-party funding.

→ p.251
↩ 032; 045
↳ 050



Die Fakultät für
Naturwissenschaften und Ergänzungsfächer
der Technischen Hochschule Karlsruhe

verleiht unter dem Rektorat des ordentlichen Professors der Lichttechnik und der Elektrotechnik Dr.-Ing. habil. Rudolf Georg Weigel und unter dem Dekanat des ordentlichen Professors für Chemie Dr. phil. habil. Rudolf Scholder

Herrn Diplom-Ingenieur

EMIL FRANK

aus Bamberg

den akademischen Grad eines Doktor-Ingenieurs (Dr.-Ing.), nachdem er in ordnungsmäßigem Promotionsverfahren durch seine Dissertation über „Aerosol" sowie durch die mündliche Prüfung seine wissenschaftliche Befähigung erwiesen und dabei das Gesamturteil

„Sehr gut bestanden"

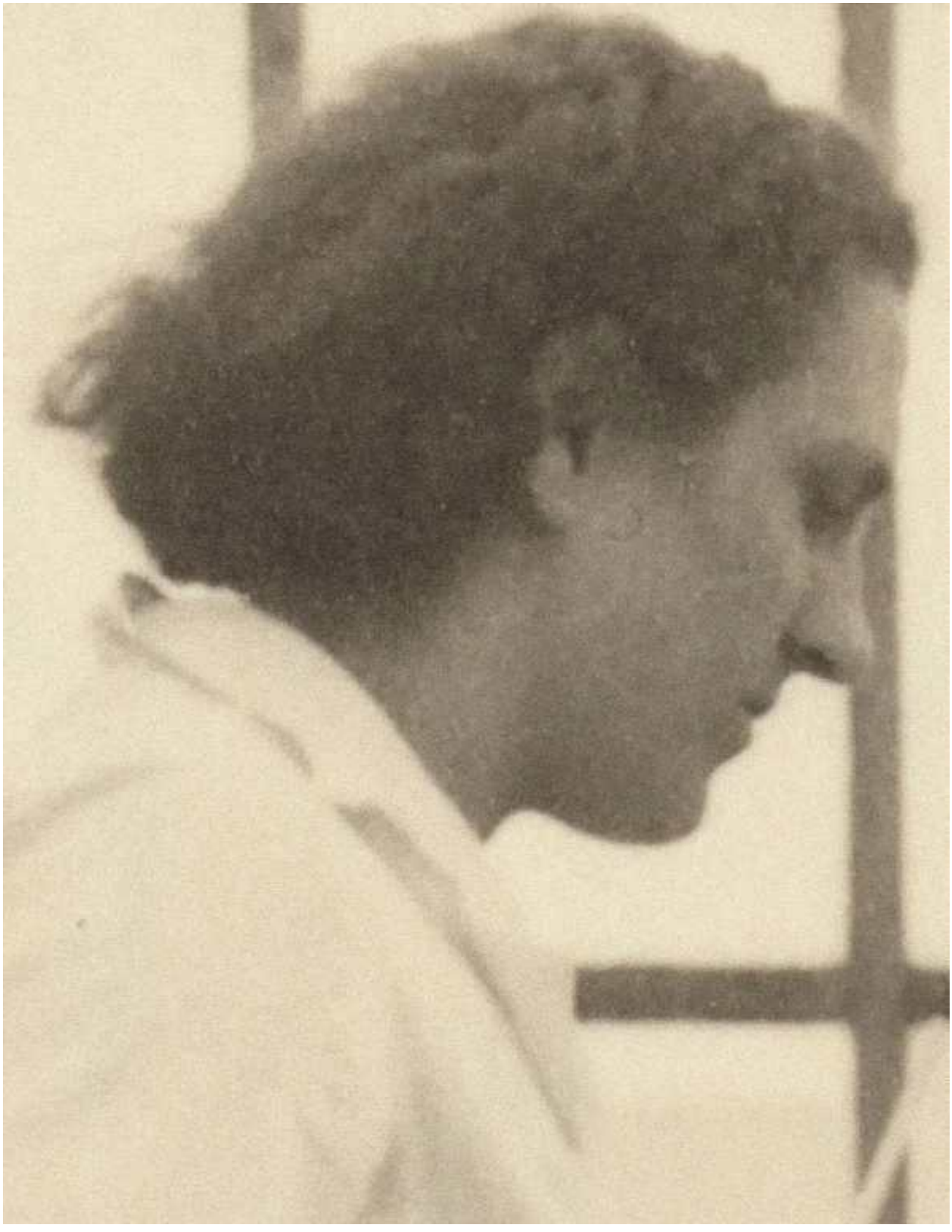
erhalten hat.

Karlsruhe, den 18. März 1944.

Der Rektor
der Technischen Hochschule
Karlsruhe:

Der Dekan
der Fakultät für Naturwissenschaften
und Ergänzungsfächer:

050 Reminiscences by Contemporaries about Studying under National Socialism and in the Postwar Period 2012 und 2015

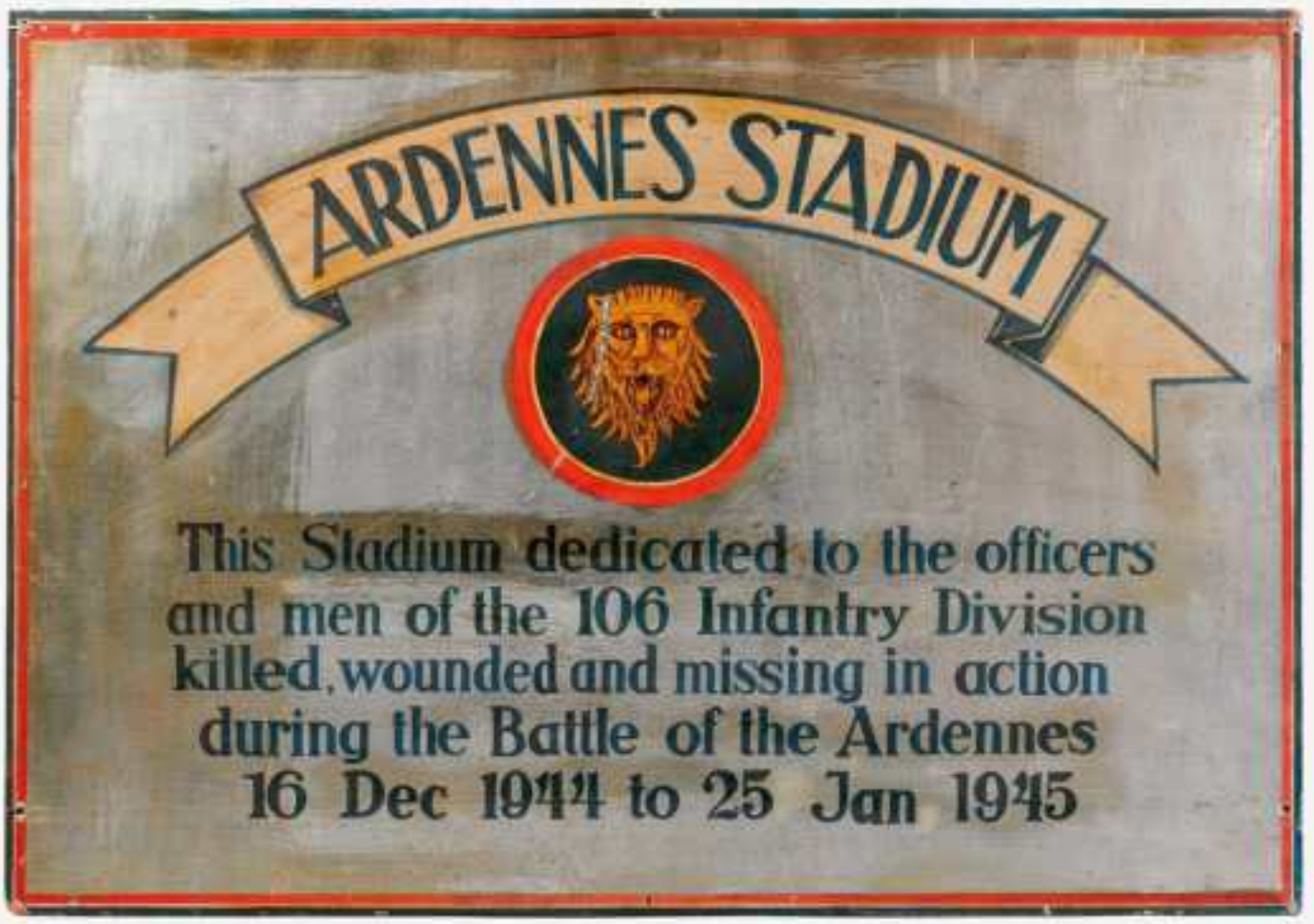


→ p.251
↩ 028; 032;
034; 045;
049
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051 Dedicatory Sign by the 106th US Infantry Division for the Stadium of Karlsruhe Polytechnic presumably 1945–1950

→ p.254
↩ 040



Die Spruchkammer III Karlsruhe (6) Karlsruhe, den 23. Juli 1947.

Aktenzeichen: 51/32/2603 - 905

Auf Grund des Gesetzes zur Befreiung von Nationalsozialismus und Militarismus v. 5. März 1946 erläßt die Spruchkammer III Karlsruhe

bestehend aus

1. Rechtsanwalt G. Stoeckhert als Vorsitzender
2. Kiefer, Richter, Fitterer, Eckert als Beisitzer
3. als öffentlicher Kläger
4. als Protokollführer

gegen Emil K i r s c h b a u m , Professor Dr. Ing., geb. am 25.7.1900 in Grötzingen, wohnhaft in Grötzingen, Goetheatr.22

auf Grund der mündlichen Verhandlung — im schriftlichen Verfahren — folgenden

Spruch:

Der Betroffene wird in die Gruppe der Mitläufer eingereiht.
Es wird ihm eine einmalige Geldsühne in Höhe von RM 2.000.- auferlegt, im Falle der Unbeibringlichkeit tritt an Stelle von je RM 35.- eine Arbeitsleistung von einem Tag.
Der Betroffene hat die Kosten und Auslagen des Verfahrens zu tragen aus einem Streitwert von RM 30.000.-

Begründung.

Der Betroffene ist von Beruf Direktor des Instituts f. Apparatebau an der Techn.Hochschule in Karlsruhe und gibt als höchstes Jahreseinkommen den Betrag von RM 30.000.- an. Sein Vermögen beträgt nach seinen Angaben RM 52.000.-
Der Betroffene war Mitglied der NSDAP von 1940 - 1945. Hiernach zählt er zu den Personen, die nach Teil B der Anlage zum Gesetz mit besonderer Sorgfalt zu prüfen sind.
Ausserdem war er Mitglied des NS-Dozentenbundes und Mitarbeiter beim örtlichen Dozentenführer.
Hiernach fällt er unter den Teil A/E Kl.II Ziff. 8 der Anlage zum Gesetz.

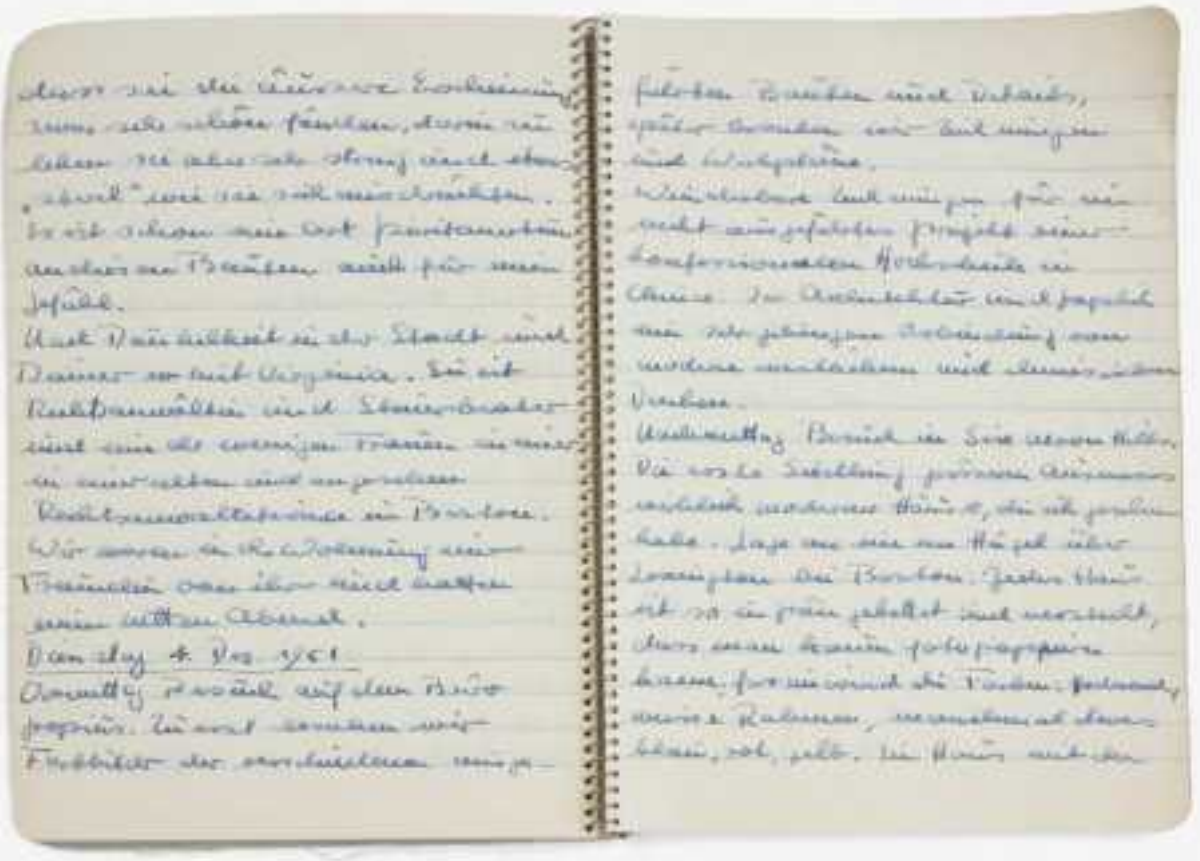
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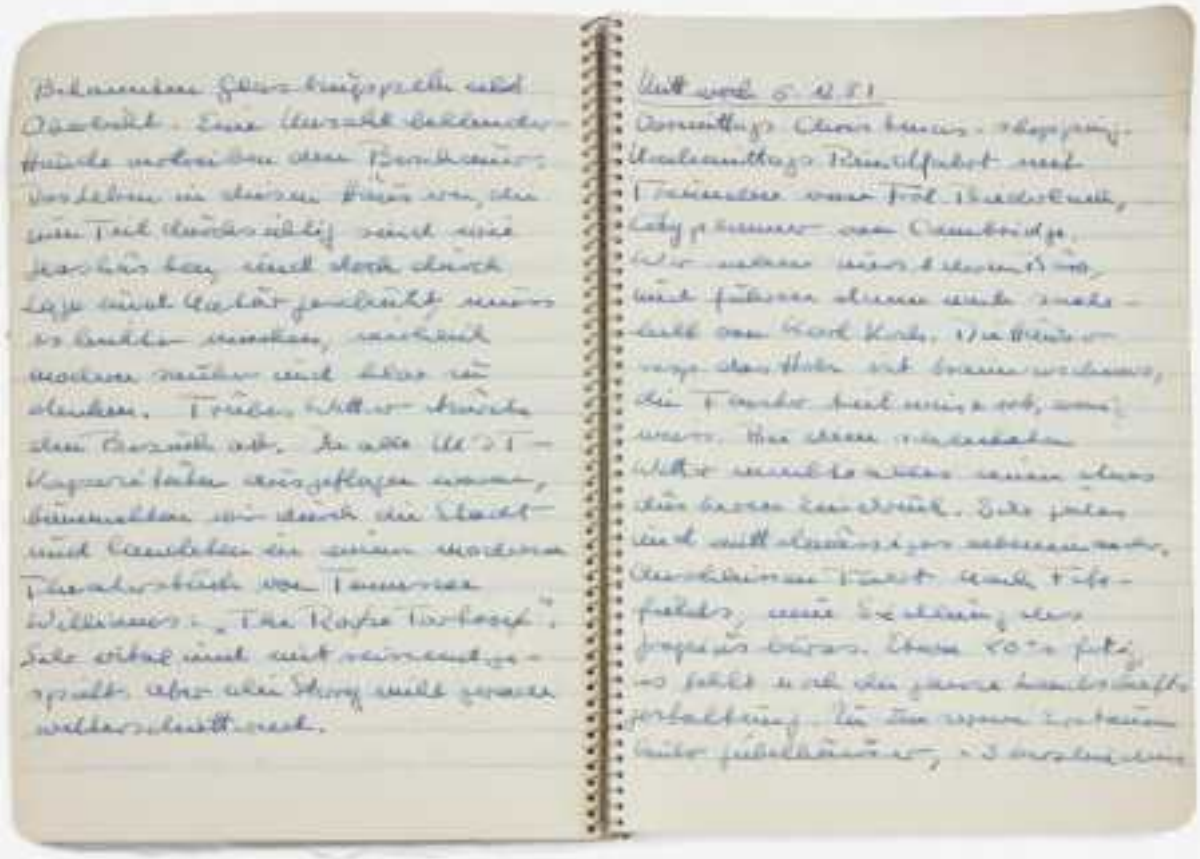
An den
Herrn Rektor der
Techn. Hochschule

K a r l s r u h e

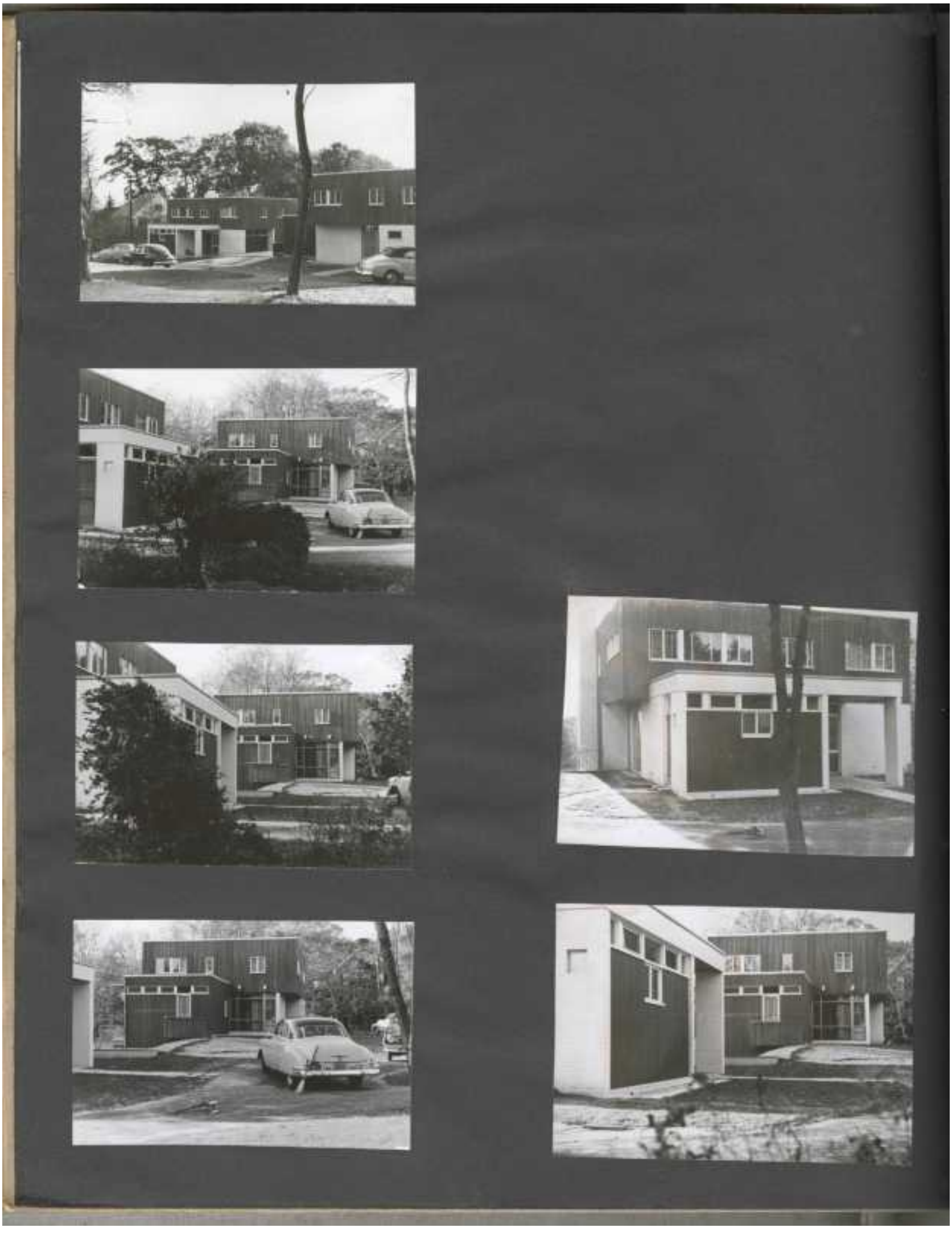

German Architects View
Home Ec Center Plans

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↩ 028; 034; 050



Eiermann Table ca. 1955

→ p.256





055 Briefcase for Confidential Documents ca. 1910

→ p.273



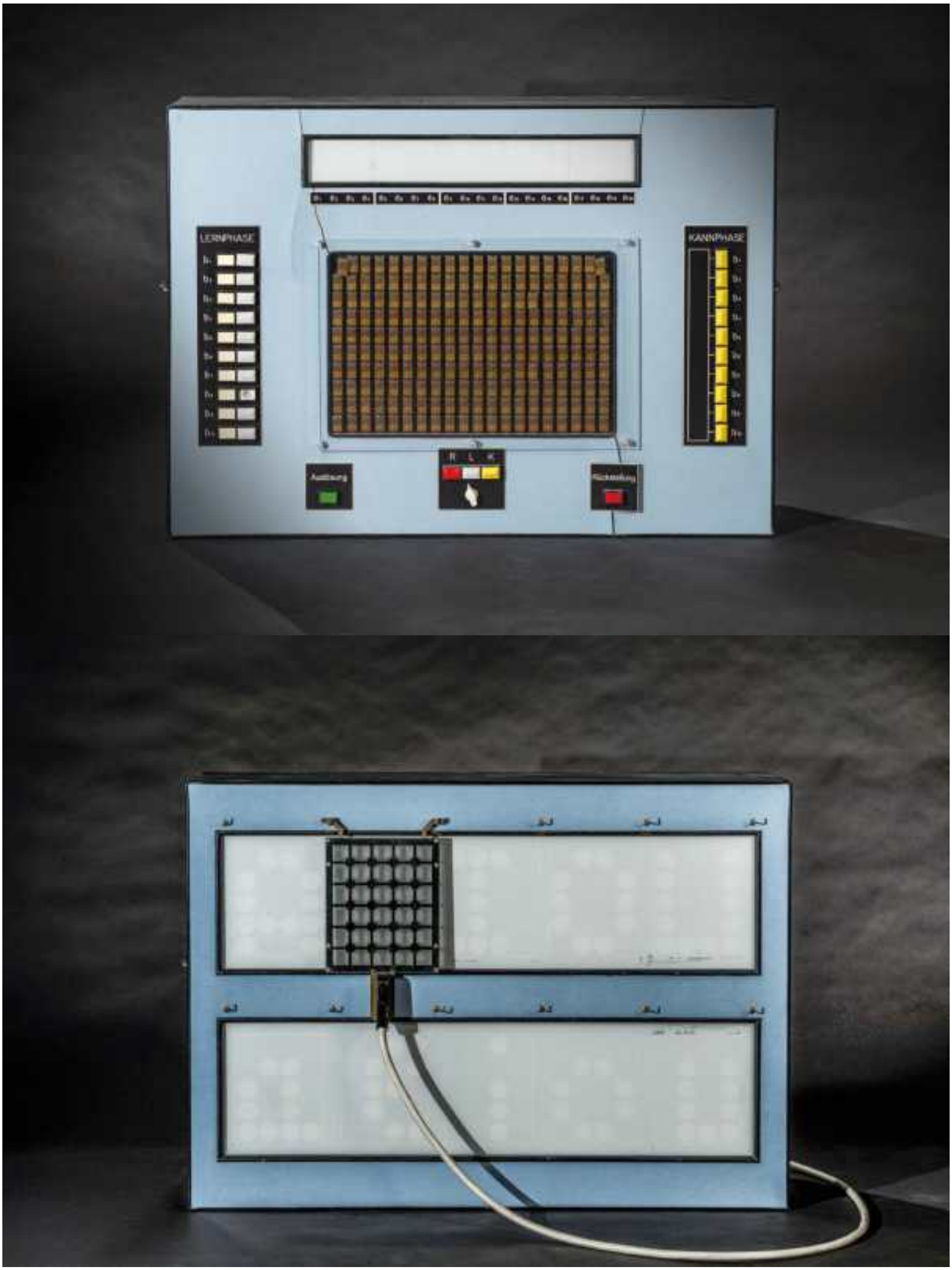
055 Briefcase for Confidential Documents ca. 1910

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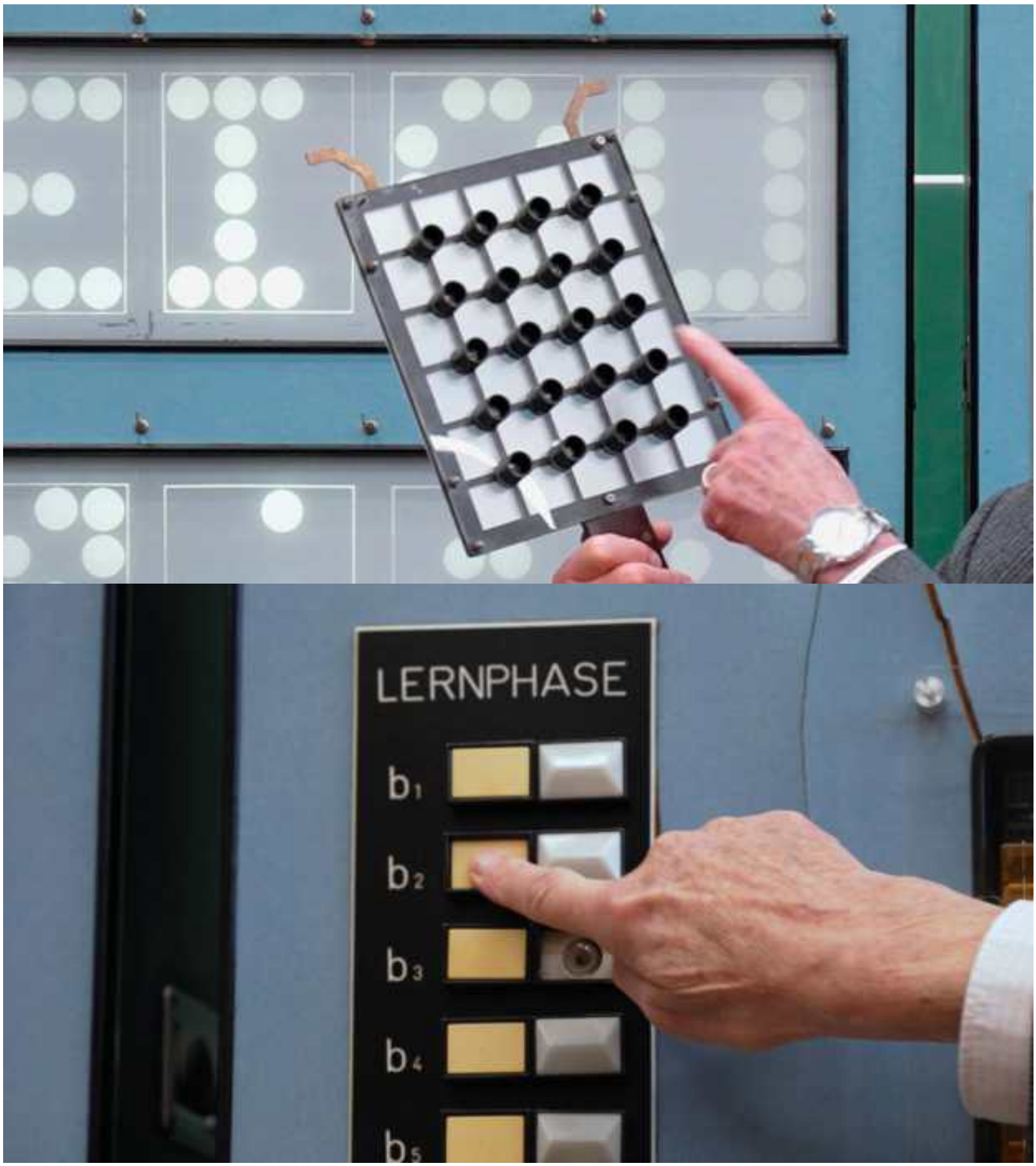
Learning Matrix for Automatic Character Recognition 1960

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↳ 100



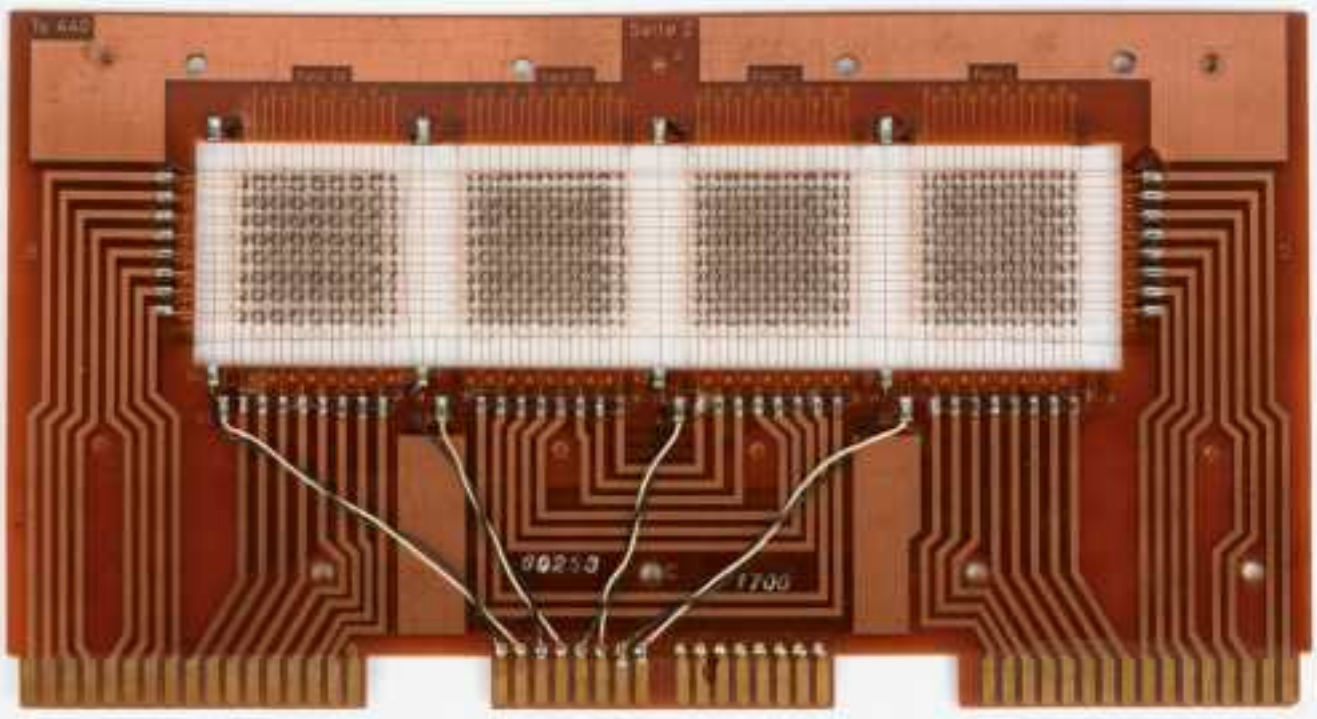
056 Learning Matrix for Automatic Character Recognition 1960

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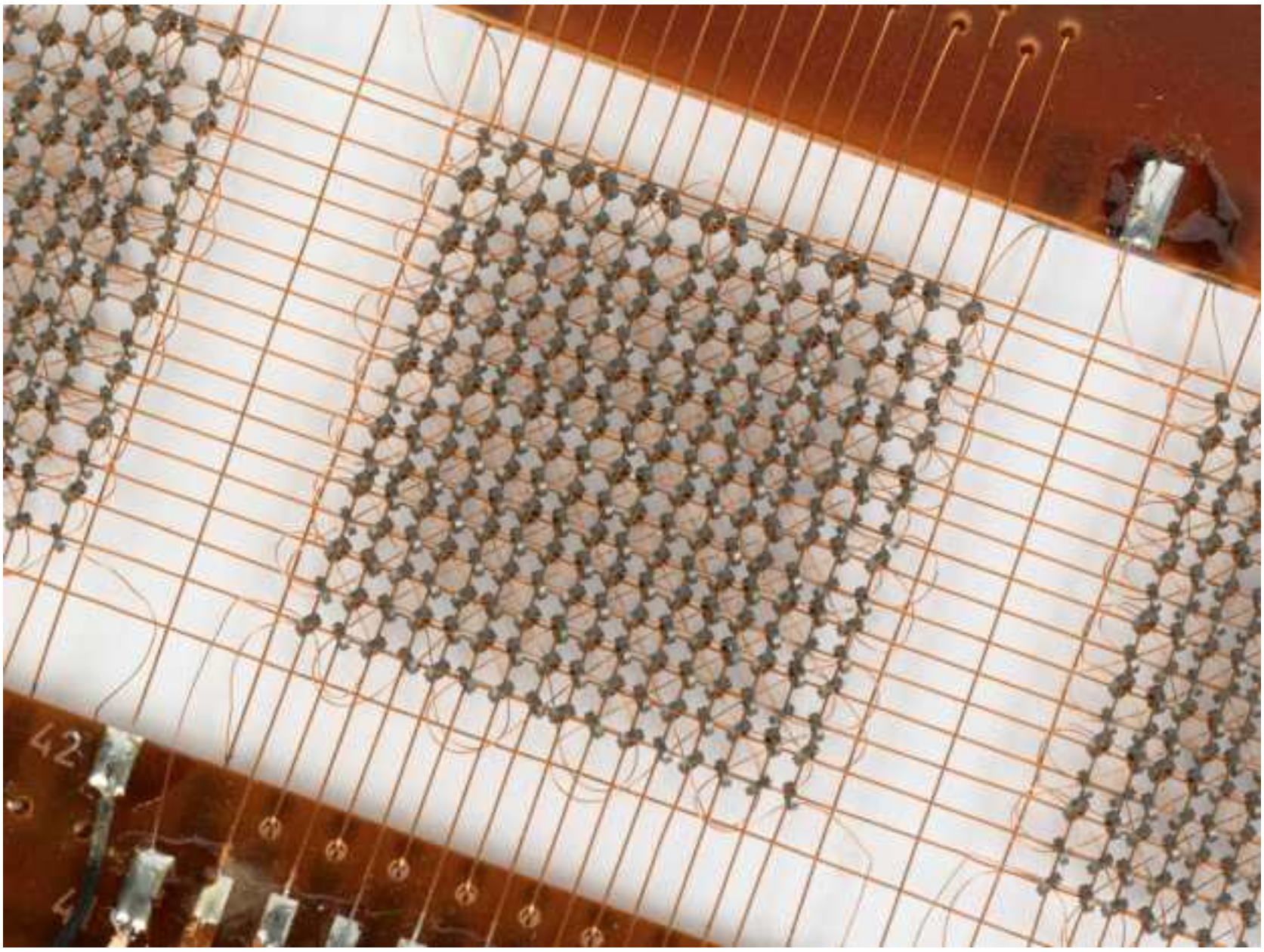
057 Core Memory 1965

→ p.274
↳ 074; 076



057 Core Memory 1965

→ p.274
↳ 074; 076



References and Notes for the Introduction

Numbers marked with the curved arrowl (↳) next to the text column refer to the corresponding object descriptions..

References

A comprehensive scholarly account of KIT's history and its foregoing institutions has yet to be written. But various studies are available, offering surveys or treating relevant aspects or periods in its history. They include scholarly treatises. Some of them offer reliable details but without spelling out the consulted sources of their findings. Others were written for publicity purposes and thus serve promotional goals. Despite these differences, it seemed reasonable, in view of the quality of the information used, to base the present historical outline on the following articles. Where self-evident, facts taken from the titles listed below are not cited in every instance.

25 Jahre Kernforschungszentrum Karlsruhe 1956–1981, publ. by Kernforschungszentrum Karlsruhe, 1981.

Michael Hartmann: Der Weg zum KIT. Von der jahrzehntelangen Zusammenarbeit des Forschungszentrums Karlsruhe mit der Universität Karlsruhe (TH) zur Gründung des Karlsruher Instituts für Technologie. Eine Darstellung nach den Aussagen von Zeitzeugen, ed. by Klaus Nippert, Karlsruhe 2013 (Veröffentlichungen aus dem Archiv des Karlsruher Instituts für Technologie, no. 3).

Klaus-Peter Hoepke: Geschichte der Fridericiana. Stationen ihrer Geschichte von der Gründung im Jahr 1825 bis 2000, ed. by Peter Steinbach, Günther Grünthal and Klaus Nippert, Karlsruhe 2007 (Veröffentlichungen aus dem Universitätsarchiv Karlsruhe, no. 1).

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Klaus Nippert, ed.: Zur Geschichte der Karlsruher Fakultät für Informatik, Karlsruhe 2007 (Veröffentlichungen aus dem Universitätsarchiv Karlsruhe, no. 2).

Klaus Nippert: Wie entstand die Technische Hochschule? Zum Einfluss der Polytechni¬schen Schule Karlsruhe auf die Entwicklung eines Hochschultyps, in: Fridericiana. Zeitschrift der Karlsruher Universitätsgesellschaft 68 (2013), pp. 9–16.

Oetzel, Günther: Forschungspolitik in der Bundesrepublik Deutschland. Entstehung und Entwicklung einer Institution der Großforschung am Modell des Kernforschungszentrums Karlsruhe (KfK). 1956–1963, Diss. Univ. Karlsruhe, Frankfurt am Main u.a., 1996 (Europäische Hochschulschriften 3/711).

Living dates of members of KIT and its predecessor institutions are based on Hoepke 1995 (see the References) and KIT archival sources. The years following a person's full name refer to living dates unless it is in the context of a term of office.

Statistics on **students** up to the summer term 1910 are taken from Badische Schulstatistik (see note 15) thereafter from the documents listed in the special inventory "Eckdaten", which inventory is available at KIT Archives.

Details on **faculty structures** and **professorship statistics** are taken from the staffing and course listings of Karlsruhe Polytechnic (TH) resp. Karlsruhe University listed in the special inventory "Eckdaten" (see above).

Dates on building-related events on the KIT South Campus are according to Hoepke 2007 (see the References), pp. 180–183.

Individual details that do not appear in the above-mentioned literature or are difficult to find there are listed in the following notes, unless they appear in a referenced object text of this volume.

Abbreviations used in References

GLAK	Generallandesarchiv Karlsruhe = General State Archives in Karlsruhe
KITA	KIT Archives

Notes

1 Neil MacGregor: Eine Geschichte der Welt in 100 Objekten. Trans. by Waltraud Götting, Munich 2011.

2 Johann Wolfgang Goethe: Faust. A Tragedy. Translated, in the original metres, with copious notes, by Bayard Taylor. Authorised edition. Published by special arrangement with Mrs. Bayard Taylor, Third Edition, London, New York, Melbourne 1890, p. 12.

3 Gesetzes- und Verordnungs-Blatt für das Großherzogtum Baden 16, 28 Aug. 1895, p. 348. The department (Abteilung) titles, including the parenthetical remarks, are according to this source.

4 Anton F. Guhl: Bemerkungen zur Gründung der Polytechnischen Schule in Karlsruhe 1925. Forthcoming as an article in the series Veröffentlichungen aus dem Archiv des Karlsruher Instituts für Technologie.

5 Ibid.

6 Ibid.

7 Paul Gehring: Professor Wucherer und seine Freiburger Polytechnische Schule von 1818. Ein Beitrag zur Gründungsgeschichte der Technischen Hochschule Karlsruhe, in: Zeitschrift für die Geschichte des Oberrheins 116 (1968), pp. 369–381.

8 Martin Benjamin Ullmann: Ankunft am Polytechnikum – Über die Zulassungsbedingungen der polytechnischen Schule in Karlsruhe und die räumliche Herkunft ihrer ersten Schüler. Forthcoming as an article in the series Veröffentlichungen aus dem Archiv des Karlsruher Instituts für Technologie. As no lists of enrollees exist for the first few years, the student totals could only be based on specific mentions in the administrative files of the college.

9 Nicolaus Moritz Novak: Stube und Gott. Soziale Herkunft und religiöse Bekenntnisse der ersten Karlsruher Polytechniker. Forthcoming as an article in the series Veröffentlichungen aus dem Archiv des Karlsruher Instituts für Technologie.

10 Arthur Böthlingk: Der deutsche Zollverein, das Karlsruher Polytechnikum und die erste Staatsbahn in Deutschland. Eine kulturhistorische Studie. Karlsruhe 1899, p. 74.

11 GLAK 206/910: Letters from Redtenbacher to the Baden government, Aug. 11, 1840, Sep. 2, 1840, Oct. 25, 1840, Nov. 30, 1840.

12 GLAK 206/950: personnel file Dienerakte Karl Weltzien, 1842–1868.
13 C. Weltzien and Heinrich Lang: Das chemische Laboratorium an der grossherzoglichen polytechnischen Schule zu Carlsruhe, Karlsruhe 1853.

14 Badische Schulstatistik. Die Hochschulen. Die Ergebnisse der statistischen Ermittlungen aus dem 19. Jahrhundert sowie für die Zeit vom Wintersemester 1900/01 bis zum Sommersemester 1910, publ. by Ministerium des Kultus und Unterrichts, Karlsruhe 1912, p. 53.

15 KITA 10001/285–342.

16 Klaus Nippert: Die Matrikel des Karlsruher Instituts für Technologie, in: Universitätsmatrikeln im deutschen Südwesten. Bestände, Erschließung und digitale Präsentation. Contributions to the conference at the Heidelberg University Archives on May 16 and 17, 2019, ed. by Ingo Runde and Heike Hawicks, 2020, pp. 101–123, esp. pp. 107–109..

17 KITA 27072 Nachlass Karl Weltzien.

18 This figure, which is significantly higher than that of the other technical colleges, should be understood to mean that the students in the basic course of study are summarized here. In the further course of their studies, they were distributed among the following technical colleges.

19 The introduction of an agricultural school was briefly attempted and given up.

20 Badische Schulstatistik (see note 14), p. 54.

21 Ibid., p. 56.

22 Life and Letters of William Barton Rogers, ed. by Emma Rogers and William T. Sedgwick, 2 vols., Boston 1896, reprint Norderstedt 2017, esp. Vol. 1, pp. 216 f.
An attempt to situate the Karlsruhe Polytechnical College within European academia is made by Danilo Capecchi and Giuseppe Ruta: European polytechnic schools in nineteenth century and Karlsruhe's exemplary case, in: Meccanica 49 (2014), pp. 13–21, DOI 10.1007/s11012-013-9866-9.

23 Nippert 2013 (see the References), p. 11.

24 "Die polytechnische Schule ist eine technische Hochschule." Großherzoglich Badisches Regierungs-Blatt 8, Feb. 20, 1865, pp. 86–92.

25 One important contribution is by Friedrich Schoedler: Die höheren technischen Schulen nach ihrer Idee und Bedeutung dargestellt und erläutert durch die Beschreibung der hoeheren technischen Lehranstalten zu Augsburg, Braunschweig, Carlsruhe, Cassel, Darmstadt, Dresden, München, Prag, Stuttgart und Wien, Braunschweig 1847, pp. 7 f.
"The polytechnic [technische Hochschule] must now follow as the keystone of technical education, which like a university is a vocational school [Fachschule] and completely finishes off the individual technical subjects. It therefore runs parallel to a university and is called by us a t e c h n i s c h e H o c h s c h u l e." (Original emphasis. Emphasis in original language.)

26 Franz Grashof: Ueber die der Organisation von polytechnischen Schulen zu Grunde zu legenden Principien, in: Zeitschrift des Vereines Deutscher Ingenieure 8 (1864), cols. 591–616.

27 GLAK 233/33151: Verordnung des Staatsministerium, Decree of the State Ministry on the admission of private lecturers to Karlsruhe Polytechnical College, Nov. 21, 1868.

28 GLAK 233/33151: Verordnung des Staatsministeriums, June 12, 1885..

29 KITA 28002/383: Anonymous: Ferdinand Redtenbacher. Bericht über die Feier seines 100. Geburtstages an der Technischen Hochschule Fridericiana zu Karlsruhe am 26. Juni 1909, undated publ. without place of publication.

30 Festgabe zum Jubiläum der vierzigjährigen Regierung seiner königlichen Hoheit des Grossherzogs Friedrich I. von Baden, publ. by Technische Hochschule Karlsruhe, 1892.

31 Helmut Friedburg: Die Karlsruher Experimente von Heinrich Hertz, in: Fridericiana. Zeitschrift der Universität Karlsruhe 41 (1988), pp. 39–57..

32 Peter M. Knoll: Otto Lehmann, der Entdecker der flüssigen Kristalle, in: Fridericiana. Zeitschrift der Universität Karlsruhe 29 (1981), pp. 43–61; Peter M. Knoll and Hans Kelker: Otto Lehmann. Erforscher der flüssigen Kristalle. Eine Biographie mit Briefen an Otto Lehmann, 1988 (author's press); H.-R. Stegemeyer: Die scheinbar lebenden Kristalle, in: Nachrichten aus der Chemie 52 (2004), pp. 903–908.

33 Badische Schulstatistik 1912 (see note 14), p. 55

34 Bericht über die Feier der Einweihung der Neubauten und der Aula am 17., 18. und 19. Mai 1899, publ. by Technische Hochschule Karlsruhe, Karlsruhe 1899.

35 Gesetzes- und Verordnungs-Blatt für das Großherzogthum Baden 26, Aug. 28, 1895, pp. 347–359.

36 Karl-Heinz Manegold: Universität, Technische Hochschule und Industrie. Ein Beitrag zur Emanzipation der Technik im 19. Jahrhundert unter besonderer Berücksichtigung der Bestrebungen Felix Kleins. Berlin 1970 (Schriften zur Wirtschafts- und Sozialgeschichte, no. 16).

37 KITA 21015/304: printed dissertations for the Diplom degree in Technical Chemistry, 1882–1901.

38 Manegold (op. cit.), p. 74.

39 Ibid., p. 300.

40 GLAK 233/33151: Verordnung des Staatsministeriums, Dec. 28, 1899.

41 Kultusministerkonferenz und Bundesministerium für Bildung und Forschung: Die Umsetzung der Ziele des Bologna-Prozesses 2000–2020. Nationaler Bericht unter Mitwirkung von HRK, DAAD, Akkreditierungsrat. fzs. DSW, GEW und BDA, undated; https://www.bmbf.de/bmbf/de/bildung/studium/bologna-prozess/bologna-prozess_node.html (accessed Sep. 20, 2024).

42 Marco Birn: Die Anfänge des Frauenstudiums in Deutschland. Das Streben nach Gleichberechtigung von 1869–1918, dargestellt anhand politischer, statistischer und biographischer Zeugnisse, Heidelberg 2015 (Heidelberger Schriften zur Universitätsgeschichte, no. 3), pp. 21–32 esp. p. 32..

43 Barbara Guttmann and Ute Grau: Geschichte der Frauen an der Universität Karlsruhe 1888–2000, ed. by Carmen Boxler, 2000 (author's press), pp. 9–11.

44 Ibid., pp. 9 f

45 KITA 21015/1007: Thekla Schild.

46 KITA 21015/4013: Elisabeth Lehmann in electrical engineering, 21015/2017: Hedwig Pleschko in civil engineering..

47 KITA 21015/7129: Solvej Johannsen.

48 Margit Szöllösi-Janze: Fritz Haber 1868–1934. Eine Biographie, Munich 1998.

49 KITA 27025 papers of Theodor Rehbock, classification unit 2, colonial matters 1894–1942.

50 The author thanks Dr. Heiko Wegmann, who is currently writing a book about Karlsruhe's colonial history, for relaying findings of his research.

51 Wilhelm Paulcke: Berge als Schicksal, Munich 1936, pp. 198–221; Gerd Falkner: Wilhelm Paulcke (1873–1949). Initiator der Gründung des Deutschen und Mitteleuropäischen Skiverbandes, in: SportZeiten 8 (2008), pp. 79–99; Swantje Scharenberg, Kurt Möser and Klaus Nippert: Physical Fitness, the Military and the University: The Case of Wilhelm Paulcke, 1880s to 1930s, in: The International Journal of the History of Sport 33 (2016), pp. 1–15, DOI: 10.1080/09523367.2017.1302929.

52 It is likely that students from abroad also died in the war, even though there is no information about this.

53 Arbeiter-, Soldaten- und Volksräte in Baden 1918/19, ed. by Peter Brandt and Reinhard Rürup, Düsseldorf 1980 (Quellen zur Geschichte der Rätebewegung in Deutschland 1918/19, no. 3), p. 172.

54 Paulcke 1936 (see note 51), pp. 237–239; Nippert, Möser, and Scharenberg 2016 (ibid.), p. 6..

55 GLAK 235/4376: Sportliches Schießen der Studierenden der Technischen Hochschule, 1921–1934.

56 Pharmacy as a course of study was reintroduced for the winter term 1946/47.

57 1100 Jahre Studierendenwerk Karlsruhe, published by Studierendenwerk Karlsruhe, 2023 (author's press), pp. 10–35.

58 Arnd Krüger and Frank von Lojewski: Ausgewählte Aspekte des Wehrsports in Niedersachsen in der Weimarer Zeit, in: Hans Langenfeld, Stefan Nielsen (eds.): Beiträge zur Sportgeschichte Niedersachsens. Part 2: Weimar Republic, Hoya 1998 (Schriftenreihe des Niedersächsischen Instituts für Sportgeschichte, no. 12), pp. 124–148.

59 Gerard Neumeier: Rudolf Plank 1886–1973: Pionier der Kältetechnik in Deutschland, in: Zeitschrift für Geschichte des Oberrheins 158 (2010), pp. 447–477; KITA 27031 Nachlass Rudolf Plank, 27044 Nachlass Emil Kirschbaum; 21011/209 personnel file Emil Kirschbaum, 1930–1970.

60 Valentin Wehefritz: Pionier der Physikalischen Chemie Prof. Dr. phil. Dr. med. h.c. Dr. sc. techn. h.c. Georg Bredig (1868–1944). Ein deutsches Gelehrtenschicksal im 20. Jahrhundert. With a preface by the rector of Karlsruhe University (TH), Prof. Dr.-Ing. Sigmar Wittig. Dortmund 1998 (Universität im Exil. Biographisches Archiv verfolgter Universitätsprofessoren 1933–1934 an der Universitätsbibliothek Dortmund, no. 3), pp. 24–30.
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61 Michael Grüttner: Studenten im Dritten Reich, Paderborn et al. 1995 (Sammlung Schöningh zur Geschichte und Gegenwart), pp. 19–31, esp. pp. 21 f.; Hoepke 2007 (see the References) p. 115.

62 Tobias Seidl: Personelle Säuberungen an der Technischen Hochschule Karlsruhe 1933–1937, in: Zeitschrift für Geschichte des Oberrheins 157 (2009), pp. 429–492.

63 KITA 27031/82: Rudolf Plank: Autobiography, ca. 1960–1971, p. 70.

64 KITA 21003/300, 1934–1949.

65 Rudolf Plank remarks about this in his autobiography (see note 63): "Conditions at German universities had meanwhile developed very unfortunately. Students were being constantly distracted by all kinds of services for the party organizations so that it became harder and harder to concentrate academically.".

66 Quote from: Festschrift zur Einweihung des Kameradschaftshauses der Karlsruher Studentenschaft und des Nationalsozialistischen deutschen Studentenbundes (NSDStB) "Oskar-Stäbel-Haus," Karlsruhe 1934 (KITA 28009/13), p. 15; 100 Jahre Studierendenwerk Karlsruhe (see note 57), pp. 36–37; KITA 10001/2349: Die Einrichtung eines Kameradschaftshauses im Fasanerieschlößchen, 1933–1941.

67 Dorothea Roos: Der Karlsruher Architekt Hermann Reinhard Alker. Bauten und Projekte 1921 bis 1958, Tübingen 2011.

68 KITA 23013/31: Dokumente zum Einschluss in den "Grundstein zum neuen Gasinstitut", 1939; 21001/1161: Ausbau der Technischen Hochschule Karlsruhe – Generalbebaungsplan, 1938–1942; 28010/I 426 and 427: Plan drawings, ca. 1939.

69 KITA 21011/225: personnel file Otto Kraemer, 1940; 27030/150: Entwicklung vom schwingungsfreien Schalterventilen für den Torpedobau, 1942.

70 KITA 23010/44: Ziviler Kriegseinsatz von Maschinenbaustudenten in Betrieben, 1943–1944; 28005/30: Persönliche Dokumente des Dr.-Ing. Hans Joachim Schmidt (*May 15, 1918), here on the year 1944.

71 KITA 23019/6: Rudolf Weigel to Kriegswirtschaftsstelle im Reichsforschungsrat, May 21, 1940; 23019/76: Geheimer Kriegsauftrag „Erkennbarkeit von Zielen bei Nacht", 1941–1942..

72 KITA 28503/180: Zeitzeugengespräch mit Frau Hilde Becht, geb. Trapp, über ihr Studium der Mathematik an der Technischen Hochschule Karlsruhe in den Jahren 1943 bis 1948, Feb. 3, 2015.

73 Autobiography of Rudolf Plank (see note 63), pp. 84 and 87.

74 KITA 21004/14: Aufbaudienst, 1947–1949; 21004/49: Aufhebung des Aufbaudienstes, 1948–1949.

75 KITA 21001/854: Vorlesungsverzeichnis für das Wintersemester 1945/46, typescript.

76 KITA 21004/68–85: Studierendenakten für das Wintersemester 1945/46 bis zum Sommersemester 1949; 21003/300: Matrikelkartei, 1934–1949; 21003/400: Matrikelkartei 1945–1985.

77 Information about the dismissals is according to Hoepke 1995 (see the References).

78 KITA 21001/628: Wiedereinstellung von Minderbelasteten als ordinary labourers, 1945–1947.

79 KITA 21001/629–632, 643.

80 Gerhard Neumeier: Die Entnazifizierung der Technischen Hochschule Karlsruhe, in: Kriegsende und Neubeginn. Die Besatzungszeit im schwäbisch-alemannischen Raum, ed. by Paul Hoser and Reinhard Baumann, Konstanz 2003, pp. 259–285.

81 KITA 21001/832: Senatsprotokolle, Dec. 7, 1945; 21001/586; Senatsprotokolle, May 26, 1948.

82 KITA 21011/225: personnel file Otto Kraemer, 1934–1986; 27030 Nachlass Otto Kraemer.

83 On Steinbuch's biography, see Anton F. Guhl: Kurskorrekturen eines Technokraten. Die politische Rechtswendung des Nachrichtentechnikers und Zukunftsforschers Karl Steinbuch nach 1970, in: Technikgeschichte 87/4 (2020), pp. 315–334, esp. p. 318.

84 KITA 21001, Klassifikationseinheit 1.2.8.13 Disziplinarordnung.

85 KITA Zugang 2008/0020: Mathematiker-Tagung in Karlsruhe 1947.

86 KITA 28014 Personal- und Vorlesungsverzeichnisse 1947–1950; 21001/1194–1196, 21001/1198, 21001/1200–1201, 21002/1565.

87 Whereas Hoepke's history of the Fridericiana (see the References) cites 1,980 students for the winter term 1946/47 another statistical source counts 2,971 students. KITA 21004/22.

88 KITA 25007 Studium generale, 1953–1985; 28014 Personal- und Vorlesungsverzeichnisse as of 1949.

89 KKITA 28008/7–10; 28503/170: Zeitzeugengespräch mit Ernst-Ulrich Hiersche und Hans Peter Knell zum studentischen Theater an der Technischen Hochschule Karlsruhe um die Mitte der 1950er Jahre, June 6, 2011.

90 KITA 28010/I 2540, 2541, 2879, 2556, 2733, 2736, 2294, 7908, 2807, 2961, 7912, 2734, 7909, 7911, 7907, 7904, 7910, 7906, 7905, 2893a, 2893b, 2343a 2343b, 2346, 3772, 3771, 2543, 2897, 7903, 2783, 490, 3211, 3256, 2943, 2942, 2883, 2610, 2681, 2683, 2682, 2857, 2858, 2609, 2964, 2811, 2965, 2959, 306, 2608, 2443, 2896, 2607, 2693, 2665, 2694, 2460.

91 Guttmann and Grau 2000 (see note 43), pp. 13–14.

92 KITA 29002/1.0; Urkunde der Landesregierung Baden-Württemberg, Dec. 5, 1967.

93 Gerhard Neumeyer: Vom Polytechnikum zur Universität (TH), in: Die Technische Universität an der Schwelle zum 21. Jahrhundert. Festschrift zum 175jährigen Jubiläum der Universität Karlsruhe (TH), ed. by Heinz Kunle and Stefan Fuchs, Berlin et al. 2000, pp. 11–61, esp. p. 31.

94 Other teaching in these subjects was done by a supernumerary professor (außerordentlicher Professor), a university lecturer and teaching assignments.

95 During the compared semesters, there were no supernumerary professorships (außerordentliche Professuren).

96 KITA 27063/3, 27063/8.

97 Hartmann 2013 (see the References), p. 29.

98 Nippert 2007 (see the References), pp. 7–70, esp. pp. 15–19.

99 Guhl 2020 (see note 83), esp. pp. 321–332.

100 KITA 28004/99: Grundordnung der Universität Fridericiana Karlsruhe (TH), passed by the constituent assembly on April 24, 1969.

101 Information on the introduction of courses in economics are according to the staffing and course catalogs of Technische Hochschule Karlsruhe, resp. Universität Karlsruhe, KITA 28014 Personal- und Vorlesungsverzeichnisse.

102 KITA 21004/24, 21004/88–92. Student statistics for the winter semesters were as follows:

	1965/66	1970/71	1975/76
Civil Engineering	992	857	1296
Electrical Engineering	1029	976	1235
Mechanical Engineering	1224	838	1335
Industrial Engineering	—	1114	1892

103 KITA 28014 Personal- und Vorlesungsverzeichnisse.

104 Kultusministerkonferenz und Bundesministerium für Bildung und Forschung (see note 41).

105 KITA 28006 Sammlung AStA, UStA und Fachschaften; 28019/6: Studentische Flugblätter, 1962–1965.

106 KITA 28006/12: ASta-Info with transcription of the BNN article of Nov. 13, 1968.

107 KITA 28503/21: Zeitzeugengespräch mit Heinz Draheim, November 2005.

108 M. Kollatz: Vom AStA zum UStA – die hochschulpolitischen Auseinandersetzungen der 70er Jahre, in Kunle and Fuchs, eds. 2000 (see note 93), pp. 469 f.

109 Neumeier 2000 (see note 93), pp. 39 f., 42 f.; KITA 28021 Sammlung Berichte und Reden der Leitungsorgane.

110 Neumeier 2000 (see note 93), pp. 37, 43; KITA 21011/2160, 2202.

111 Hoepke 2007 (see the References), p. 143

112 KITA 28020/36.

113 Neumeier 2000 (see note 93), pp. 33 f., 40 f., 44 f.

114 Ibid., p. 40.

115 KITA 21002/217, 273, 382, 383, 385–387, 561.

116 KITA Zugang 2020/0004.

117 The newspaper clippings collection by Karl Wirtz documents this nuclear physicist's interest in this topic. KITA 28027 Sammlung Karl Wirtz, 1945–1954.

118 The text of this manifesto is accessible at https://www.uni-goettingen.de/de/text+des+göttinger+manifests/54320.html (accessed on Feb. 5, 2025).

119 Armin Hermann: Karl Wirtz – Leben und Werk. „Eine weit überragende physikalische Begabung", Stuttgart 2006, esp. pp. 98 f., 112–122.

120 Kathrin Kranich: Zur Bedeutung des Kernforschungszentrums Karlsruhe für die Entwicklung der Gemeinde Leopoldshafen, in: 10 % Das Bildarchiv eines Kernforschungszentrums betreffend, ed. by Susanne Kriemann et al., Leipzig 2021, pp. 433–437.

121 KITA 28503/179: Zeitzeugengespräch mit Hans Kiefer, Leiter des Strahlenschutzes am Kernforschungszentrum Karlsruhe, Apr. 3, 2013.

122 KITA 28028 Fotos Kernforschungszentrum Karlsruhe und Forschungszentrum Karlsruhe, 1955–2007.

123 KITA 27062 Nachlass Gerhard Krüger; 21011/1048: Personnel file on Gerhard Krüger, 1971–2013.

124 KITA Zugang 2023/0012, 2024/0002: Akten der Patent- und Lizenzabteilung, 1959–1985; Dennis Romberg: Atomgeschäfte. Die Nuklearexportpolitik der Bundesrepublik Deutschland 1970–1979. Paderborn 2020.

125 Bernd-A. Rusinek: Der Fall Greifeld. Wissenschaftsmanagement und NS-Vergangenheit, Karlsruhe 2019 (Veröffentlichungen aus dem Archiv des Karlsruher Instituts für Technologie, no. 5).

126 Apart from Rusinek 2019 (ibid.), another pertinent publication is: Thomas Raithel and Niels Weise: "Für die Zukunft des deutschen Volkes." Das bundesdeutsche Atom- und Forschungsministerium zwischen Vergangenheit und Neubeginn 1955–1972, Göttingen 2022, pp. 366–390.

127 See Rusinek 2019 and Raithel and Weise 2022 (see notes 125 and 126), pp. 287–333.

128 Carmela Thiele: Mozarts Rondo in D-Dur KV 382. Walter Bauer und das Kammerorchester des Kernforschungszentrums, in Kriemann et al. eds. 2021 (see note 120), pp. 359–361.

129 Hartmann 2013 (see the References), pp. 29–39.

Keywords in the Object Descriptions

In addition to the primary arrangement of the exhibits in chapters presented in this volume, the exhibition offers alternative avenues along the following themes:

Research,
Teaching and Academic Study,
Innovation,
Everyday Life and Culture,
Call for Objects,
Milestones in KIT's History.

These keywords appear at the end of each object description, tagged by a sloping arrow (↘).

Bent arrows (↳/↩) mark a sequential cross-reference to other objects, also in the illustration section.

Beginnings

001 Portrait of
Gustav Friedrich Wucherer
(early 19th c.)

The only portrait of a professor among these 100 objects on the history of KIT is that of Gustav Friedrich Wucherer (1780–1843). As director, he oversaw the founding of Karlsruhe Polytechnical College, which was established in October 1825. His teaching at Freiburg University as professor of physics in addition to his role as municipal pastor had qualified this Protestant clergyman for the task. From 1818 to 1822, Wucherer had also run a polytechnical institute in Freiburg at his own initiative, which served as a precursor to the Karlsruhe college. This experimental institution in Freiburg had primarily focused on vocational training and took the first step toward designing a canon of polytechnical subjects. The curriculum of Karlsruhe Polytechnical College reflected the same emphasis on mathematics and, in particular, descriptive geometry. Wucherer directed Karlsruhe Polytechnical College until 1834. His departure as director was related to the college's constitution introduced in 1832, which, among other changes, brought about self-governance by faculty boards. This as well as the introduction of annual elections of the director from among the teaching staff was the beginning of a process toward assuming the organizational structure of a university. This reorganization motivated Wucherer to return to his professorship in Freiburg. *kn*

Detail from a group portrait of
Freiburg professors.
Lithograph by P. Wagner/Karlsruhe,
8.0 × 9.5 cm.
Freiburg University Archives D13/577.

↘ Teaching and Academic Study;
Milestones in KIT's History

↩ 004

002 Theodolite
(ca. 1820)

This theodolite, kept at the KIT Geodetic Institute, represents here the activities of engineer Johann Gottfried Tulla (1770–1828). Tulla initiated the channelization of the Upper Rhine and founded a predecessor to the current KIT Department of Civil Engineering, Geodesy and Environmental Sciences. Surveying the course of the Rhine was a necessary precondition for its straightening, as was mapping the Grand Duchy of Baden for many road-building projects, which was carried out under his direction. Tulla recognized that a dedicated school was needed to train specialists for the state's

construction projects. This insight was behind the proposal first submitted in 1808 by a government commission with Tulla's participation, to establish a polytechnical school in Karlsruhe. Initially, however, the engineers received their training in a separate school which had been set up at Tulla's instigation in the Waterway and Road Building Office in 1807. After his death, this engineering school became an independent school within Karlsruhe Polytechnical College.

Theodolites are used for measuring angles in land surveying. In a process known as triangulation, the surveyor begins by taking the angles formed between a measured straight distance on the terrain and the lines of sight to a third point, such as a church tower, extending from both ends of this distance. Using the measured distance and these two angles, the lengths of the sight lines can be calculated as the other sides of a triangle. Additional triangles can be drawn from these side lengths, their other side lengths calculated, and a successive network of triangles can be formed without taking any more length measurements. A repeating theodolite as shown here takes serial measurements of the same angle, and each value is added by advancing the ring-shaped movable graduated scale. The multiplied measurement value is then divided by the number of repetitions to achieve greater accuracy. *kn*

Repeating theodolite,
maker: Baumann/Stuttgart,
ca. 30.0 (diameter) × 35.0 cm,
brass and other metal, glass.
KIT, Geodetic Institute.

↘ Teaching and Academic Study;
Milestones in KIT's History

↳ 058

003 Sketchbook by an Architect (ca. 1824)

The sketchbook by August Moosbrugger (1802–1858) contains architectonic studies and drawings made as a pupil at Johann Jakob Friedrich Weinbrenner's (1766–1826) building school, which is a predecessor to the KIT Department of Architecture.

Weinbrenner (1766–1826) opened this school at Ettlinger Tor in 1800, and it quickly became the leading training center for architects and aspiring building officials in southwest Germany. As Baden's director of construction, Weinbrenner oversaw the entire building sector of the Grand Duchy. The buildings he designed and constructed significantly shaped the cityscapes of Karlsruhe and Baden-Baden. His publications and teaching of around 100 pupils from his building school ensured widespread influence of the so-called Weinbrenner style.

After Weinbrenner's death, this building school continued as a higher educational institution for architects. In 1832, it was integrated into the restructured Polytechnical College to form a technical school for civil architecture. A continuous line of development leads from there to the current Faculty of Architecture at KIT.

August Moosbrugger's subsequent career was equally successful. He worked as a professor of geometry and drawing at the Lyceum in Rastatt from 1826 prior to his appointment as building inspector in Wertheim, Hesse, in 1836. *as, kn*

August Moosbrugger: sketchbook,
ca. 22.0 × 15.0 cm.
saai | Archive for Architecture and Civil Engineering at KIT, MOSB_SB_001.

↘ Teaching and Academic Study;
Milestones in KIT's History

004 Founding Charter of Karlsruhe Polytechnical College (1825)

On October 7, 1825, Grand Duke Ludwig I of Baden signed the founding charter of Karlsruhe Polytechnical College, thereby marking the beginnings of KIT. This act garnered significant external recognition. During the Holy Roman Empire, which dissolved in 1806, university foundations by territorial rulers had required imperial approval. In the post-empirical period, the Karlsruhe charter showcased the Grand Duke as a sovereign ruler not subject to any higher sanction. The text of the charter presents Ludwig I as a benevolent regent concerned about the welfare of his realm. It positions the Polytechnical College within the educational system as an institution separate from universities, in which scientific knowledge is practically applied. The areas of application in the private sector are distinguished from those in the public sector, since technically proficient civil servants were wanted as much as management personnel for industry. This new charter thus represented an innovative step in the development of the Grand Duchy of Baden. Gustav Friedrich Wucherer, a theologian and physicist from Freiburg, became its first director. *kn*

Founding charter by Grand Duke Ludwig I of Baden, October 7, 1825,
34.5 × 23.5 cm,
paper.
Karlsruhe General State Archives 235/4106.

↘ Teaching and Academic Study; Milestones in KIT's History

↩ 001

005 First Printed Program of Courses at the Polytechnical College (1832)

The first program of Karlsruhe Polytechnical College to appear in print was for the 1832/33 school year. Like a university course catalog, it provided information about the teaching staff, available courses, and admission requirements. This publication coincided with a significant restructuring of the college by State Councilor Carl Friedrich Nebenius (1784–1857). The Building School, previously headed by Friedrich Weinbrenner (1766–1826), was incorporated into the Polytechnical College as a separate technical school, along with the Engineering School founded by Johann Gottfried Tulla (1770–1827). The Forestry School from Heidelberg was also added. Other technical branches established at the Polytechnical College included the Higher Vocational School and the Commercial School. This reform led to the creation of distinct courses of study.

The printed program presents the subjects taught at Karlsruhe Polytechnical College within a systematic structure and the courses of study derived from them. It also lists collections, libraries, and other facilities available for study and teaching. The standard age of admission for pupils was set at 15. An attached program for an affiliated preparatory school reveals that previous schooling did not sufficiently meet the educational equirements expected by the Polytechnical College. *kn*

Programm der Großherzoglich Badischen Polytechnischen Schule zu Karlsruhe für das Jahr 1832–33,
(Karlsruhe 1832),
ca. 19.5 × 24.8 cm, 34 pages.
KIT Library Archives IV,01.

↘ Teaching and Academic Study; Milestones in KIT's History

006 Signpost to the Reactor Station (1957)

The photograph depicting the installation of a signpost showing the way to the reactor station in Karlsruhe on April 13, 1957, is well-known to KIT North Campus employees. It has been frequently displayed as a symbol of the Nuclear Research Center's beginnings. The image shows the installation of a signpost at the intersection of regional route no. 559 and the former federal route B 36, essentially out in the countryside. At that time, the small fishing village of Leopoldshafen was located one kilometer further west on the Rhine. Today, the intersection shown is quite centrally situated in the since-developed town of Eggenstein-Leopoldshafen and the B 36 was relocated significantly further east as a local bypass in 1979.

The official inauguration took place on July 19, 1956. Franz Josef Strauß, the German Federal Minister of Nuclear Affairs at the time, signed the founding charter of the Kernreaktor Bau- und Betriebsgesellschaft mbH. This research institution, jointly supported by commercial enterprises, the German federal government, and the state of Baden-Württemberg, was tasked with "the acquisition, collection, and evaluation of scientific and technical knowledge and experience in the construction and operation of a reactor station for the development and peaceful utilization of nuclear energy in the public interest […], and the promotion of practical training for young scientists and technicians." /130

The Hardtwald forest in the Leopoldshafen district was chosen as the site for the reactor station. The initially planned site near Karlsruhe was close to the Rhine, which posed a too high risk of flooding. *as*

Installation of a signpost to the Karlsruhe reactor station,
photographer unknown,
April 13, 1957,
6.0 × 6.0 cm,
black-and-white negative.
KIT Archives 28028/11813.

↘ Research; Milestones in KIT's History

007 Forearm Prosthesis (ca. 1945)

The career of Dr. Reinhold Reiter (1920–1998) ranges from the invention of a prosthetic arm to groundbreaking research in physical bioclimatology and climate science. The Alpine Campus in Garmisch-Partenkirchen, now part of KIT, can trace its origins back to the research institute he established.

At just 14 years of age, Reiter was already experimenting with electrical X-ray phenomena. As an assistant at the Air Force Institute of Aviation Medicine in Munich, he began developing an electric hand prosthesis in 1943, which he called the "electric artificial hand." Reiter discovered that certain atmospheric electrical conditions could cause control of the prosthesis by the muscles in the arm stump to fail. These conditions also altered his patients' sensation of pain. In 1948, he presented his hand prosthesis at the Hanover Export Fair and published a scientific paper on it. Unfortunately, he was unable to develop his artificial hand further when the investor company went bankrupt.

Reiter began in 1954 to research, in an observatory he had built himself, what atmospheric disturbances might have affected the artificial hand and noticed that radioactive trace elements had also been involved. The question was, where these substances came from: Did they come from the ground or the atmosphere? Possibly even from far away? This problem interested the US Air Force when it was conducting atomic bomb experiments, above all, in the Asiatic and Pacific regions. Its funding supported the establishment of other measurement stations, also on the peak of Zug Mountain at almost 3,000 m above sea level. The distribution of radioactive particles then measurable at that altitude confirmed that they came from remote atmospheric transmission. These measurements of atmospheric radioactivity were the starting point of the scope of topics now occupying atmospheric environmental research. They include research on acidic rain in the 1980s and air pollution in the 1990s. One current focus is, recording the regional consequences of global warming, such as in the form of torrential rains or droughts.

In 1962 the Institute of Atmospheric Environmental Research founded by Reiter was incorporated into the Fraunhofer Society. On January 1, 2002 its transfer over to Karlsruhe Research Center as the fourth division of the Institute of Meteorology and Climate Research (IMK) was completed. *as*

Electric forearm prosthesis,
maker: Reinhold Reiter,
ca. 43.5 × 8.5 cm (diameter),
wood, metals, and other materials.
KIT Alpine Campus, Institute of Meteorology and Climate Research, Atmospheric Environmental Research Department, Garmisch-Partenkirchen.

↘ Research; Innovation; Call for Objects; Milestones in KIT's History

↳ 073

Object proposal
We regard this exhibit [the hand prosthesis] as the point of departure or starting point for our institute's founding in 1954, 70 years ago.
KIT, Institute of Meteorology and Climate Research – Atmospheric Environmental Research (IMK-IFU), Garmisch-Partenkirchen

008 Research Reactor FR 2 (1961)

Research Reactor FR 2 was the first nuclear reactor designed in Germany to achieve an atomic chain reaction. It was constructed in a period of six years. The reactor first became "critical" in March 1961 — an operating state where the neutrons released by nuclear fission maintain a stable series of further nuclear fissions. Known within the Center as "FR 2," this reactor consumed natural uranium as fuel. In this type of reactor, the fuel elements are located in a tank containing heavy water. Unlike ordinary hydrogen, the hydrogen atoms in heavy water contain not only a proton and an electron, but also a neutron. With these additional particles, heavy water can better reflect the neutrons emitted by the fuel elements during nuclear fission onto the uranium fuel to trigger renewed nuclear fission. Using expensive heavy water obviates the need to enrich the fissile portion of uranium, a process involving costly material and technology. The reactor was used for research purposes. Its energy output, initially 12 and later 44 megawatts, was not used to generate electricity. FR 2 was utilized for basic physical research, fuel element development, and materials science investigations. It also produced preparations used in radiation therapy. FR 2 was operated until 1981. The fuel elements were removed, the heavy water sold, and the reactor core sealed. The reactor building was transferred into the hands of *Kerntechnische Entsorgung Karlsruhe GmbH*. This company plans to completely dismantle it to return the site into a "green field" state, scheduled to begin in the 2030s. *kn*

Heavy-water-moderated nuclear reactor,
maker: Kernreaktor- Bau- und Betriebsgesellschaft mbH Karlsruhe,
in operation 1961–1981,
9.0 × 7.1 m (surface of the reactor block on the experimentation level).
Kerntechnische Entsorgung Karlsruhe,
KIT North Campus, building 607.

↘ Research; Innovation;
Milestones in KIT's History

↳ 064; 066; 067; 072; 089; 097

009 KIT Logo
(2006)

Karlsruhe Research Center and Karlsruhe University had maintained a close cooperative relationship for decades. The plan to bring together these two institutions emerged in 2006 under the rubric "*Vision KIT*" in the context of the Excellence Initiative of the German federal and state governments. The main proponents of this merger were Horst Hippler, rector of the university, and Manfred Popp, chairman of the board of the Research Center.

On October 13, 2006, these institutional partners were pronounced winners of the Excellence competition on the strength of their merger idea. However, the exact nature of KIT still had to be negotiated. The federal government, the main sponsor of the Research Center, and the state government, sponsor of the university, still needed to be convinced of the benefits of a full merger. An important milestone was the founding agreement signed on December 13, 2007, an internal accord between the Research Center and the university. With the approval of their respective sponsors, both partners were able to become committed to the goal of a complete merger. The official establishment of KIT followed on October 1, 2009, after the legal framework had been set down in the KIT Act issued by the state of Baden-Württemberg.

The newly formed institution needed a fresh identifying image. A logo was designed making visual reference to the fan-shaped layout of the city of Karlsruhe. The green used in the logo's form is exactly in-between the two shades of green previously employed in the logos of Karlsruhe Research Center and Karlsruhe University. This color choice symbolized a partnership of equality, intended to assuage concerns by both parties about any loss of influence to the other half. *as*

KIT logo,
abstract pattern with a specified shape
and color.
Its use is reserved to KIT as a registered
trademark.

↘ Everyday Life and Culture;
Milestones in KIT's History

↳ 081

The Polytechnical College (1825–1885)

010 Spherical Section Model (1833)

This model made of brass plates and paper in 1833 is an early teaching aid from Karlsruhe Polytechnical College, the oldest institutional forerunner of KIT. Two pairs of flat, parallel quadri-spherical sections intersect perpendicularly to each other, and guiding lines indicate certain properties of a sphere — situations of descriptive geometry. This mathematical area took up a large share of the polytechnical college's curriculum, because it offers the foundations for solving design problems. The model bears the maker's mark "Berckmüller & Messmer" and is therefore connected with the mechanical workshop that had been set up at the polytechnical college in early 1833 under the direction of the mechanic Jakob Friedrich Messmer (1809–1881). This establishment had two declared goals. Pupils at Karlsruhe Polytechnical College should gather practical experience there and their efforts should alleviate the previously deplored shortage of models for instruction. It was also expected that the head of the workshop carry out orders placed by the college. This link between practice and theory was an important aid for a polytechnician to start a successful career. This is demonstrated by Messmer's own course in life, who left his position in Karlsruhe to later become director of a locomotive factory in Grafenstaden near Strasbourg. Another instance is the biography of the machine manufacturer Emil Kessler, who had studied at the polytechnical college and is known to have worked in one of Messmer's workshops. *kn*

Model of spherical sections,
maker: Berckmüller & Messmer/Karlsruhe,
19.2 × 21.4 × 19.2 cm,
brass and paper.
KIT Archives 28508/54.

↘ Teaching and Academic Study

↩ 018; 020

011 Periodic Table of the Elements (1869)

The arrangement of the chemical elements in the periodic table is familiar to most people from school, often depicted on a wall chart or scrollable screen. Illustrations of the periodic table are widespread, even appearing as household decor on items like shower curtains. The knowledge systematically presenting the constituents of matter as atoms and their various properties, has a long history. The first International Congress of Chemists, held in Karlsruhe in 1860, aimed to establish a common definition of the atom. Although this meeting

did not immediately reach the desired consensus, the findings shared there laid the groundwork for a systematic ordering of the chemical elements. Two participants at the Karlsruhe Congress, Dmitry Mendeleyev (1834–1907) and Lothar Meyer (1830–1895), almost concurrently drafted the periodic table entirely independently of each other in 1869. At that time, Meyer was a chemistry professor at Karlsruhe Polytechnical College. The Chemical Institute, established by his predecessor Karl Weltzien (1813–1870), conducted both research and teaching. This integration of the two tasks was not yet commonplace at Karlsruhe Polytechnical College. The discipline of chemistry thus provided crucial impetus for the further development of the institution as a whole. *kn*

Wall chart with the periodic table of the elements,
maker: Ernst Klett Verlag/Stuttgart, 1962,
194.7 × 133.3 cm (without rods).
Bismarck-Gymnasium Karlsruhe.

↘ Research; Teaching and Academic Study

↩ 029; 036; 038

The Periodic System of the Elements and the Karlsruhe Congress of Chemists

The periodic system of the elements (PSE) is a tabular listing of all chemical elements, arranged by increasing atomic number. Elements with the same number of electron shells are placed next to each other in periods. Elements with similar chemical properties are grouped vertically into columns. Historically, the PSE was crucial for the prediction and discovery of new elements and their properties.

In December 1869, Lothar Meyer, a professor of chemistry in Karlsruhe, described the PSE in an article in *Annalen der Chemie und Pharmacie*. Meyer had previously outlined a similar table in his textbook from 1864, *Die modernen Theorien der Chemie*. However, when UNESCO declared 2019 as the International Year of the PSE, it referred not to Lothar Meyer, but to the publication of a periodic table by the Russian chemist Dmitry Mendeleyev in July 1869. In recognition of both their contributions, Mendeleev and Meyer were jointly awarded the Davy Medal of the Royal Society in 1882 for their researches into the classification of the elements.

Of decisive influence on Mendeleyev and Meyer's work on the periodic table was their participation in the Karlsruhe Congress of Chemists in September 1860. This first international conference of the emerging science of chemistry, attended by 127 chemists, was organized by Karlsruhe chemistry professor Karl Weltzien along with two colleagues from France and Belgium. The goal was to clarify fundamental questions of chemical structure theory through discourse with fellow specialists. The contribution by the Italian chemist Stanislao Cannizzaro (1826–1910) provided significant impetus for Mendeleyev's and Meyer's conception of the PSE. Building on the ideas of his compatriot Amedeo Avogadro (1776–1856), Cannizzaro clarified the then highly controversial issue of calculating atomic weights. Lothar Meyer later reflected on this breakthrough: "The scales fell from my eyes, the doubts vanished, and a feeling of calmest certainty took their place. […] Many other participants at the meeting must have felt the same way as I did." ↗ 131

Michael Mönnich

012 Herbarium of Alexander Braun (ca. 1840)

The herbarium, part of a botanical collection by Alexander Braun (1805–1877), includes specimens such as the Chenopodium procerum of the genus goosefoot, here mounted on cardboard. Braun taught botany and zoology at Karlsruhe Polytechnical College from 1833 on. His courses were part of the curriculum of both the Forestry School and the Higher Vocational School, which were separate technical schools within the college.

Although Braun's primary role was teaching, his extensive collecting activities reflect his dedication to research. At this time, biologists focused on taxonomy, the comparative study of organisms, and conclusions drawn about their interrelatedness based on morphological characteristics.

Such research and the resulting scientific publications likely facilitated Braun's subsequent academic career. From 1846, professorships followed in Freiburg, Giessen, and ultimately at Berlin University. His professional development exemplifies that of many nineteenth-century scientists who used a polytechnical college as the first step toward a university career. This was also true institutionally. Staff exchanges with universities during this period were instrumental in the further development of Karlsruhe Polytechnical College.

Botany and zoology, fields which Braun taught, continue to be part of KIT's curriculum today. *kn*

Herbarium page,
ca. 28.1 × 22.3 cm (all mounted specimens).
State Natural History Museum Karlsruhe,
KR0193703.

↘ Research; Teaching and Academic Study; Call for Objects

Object proposal

Dr. Peter Müller, Naturwissenschaftlicher Verein Karlsruhe

Karlsruhe as the Cradle of Genetics

Joseph Gottlieb Kölreuter (1733–1806) was appointed in 1763 by the Electors of Baden to head the Botanical Palace Gardens and serve as Professor of Natural History in Karlsruhe. By crossing plant species, he demonstrated that in sexual reproduction, both the male and female contribute genetic information equally to their offspring. This finding challenged the prevailing belief of the time that inheritance occurred solely through the male. A century later, Kölreuter's work provided important impetus for Gregor Mendel (1822–1884) 100 years later to explore the inheritance of individual traits across generations. Mendel's research laid the foundation for genetics as a central discipline in biology. Kölreuter also observed that hybrids of closely related species exhibited particularly vigorous growth — a phenomenon now widely utilized in agriculture to enhance the yield of hybrid varieties. In recognition of Kölreuter's pioneering contributions, the Botanical Institute at KIT was renamed the Joseph Gottlieb Kölreuter Institute of Plant Sciences (JKIP) in 2023.

Holger Puchta, Peter Nick (JKIP)

013 "Kneipbild" (1844)

This silhouette is of a student from Karlsruhe Polytechnical College sporting the colors of a Karlsruhe student fraternity, presumably the Vitruvia, on his cap and ribbon. Handwritten below: "A. Eck seinem Schaedel, Carlsruhe 1844", along with a monogram for the fraternity's motto, the so-called *Zirkel*. Before the advent of photography, such representations, known as *Kneipbilder* (literally, 'libation portraits') or *Couleurbilder*, depicted members of student fraternities. These images were exchanged among students and kept as mementos after graduation. Long rows of them were also displayed on the walls of a fraternity house. These customs, common among student fraternities, illustrate that the students at Karlsruhe Polytechnical College were following university traditions long before it became an officially acknowledged advanced Polytechnic. The first student fraternities in Karlsruhe were established in the mid-1830s, well before the Baden government recognized the university ranking of this college. This reflects how much the students' sense of identity and tradition anticipated the formal development of their educational institution. *kn*

Kneipbild with silhouette of Arthur von Eck and dedication to Franz Schaedel,
ca. 8.6 × 10.2 cm,
India ink, behind glass in wooden frame.
KIT Archives 28005/36.

↘ Everyday Life and Culture

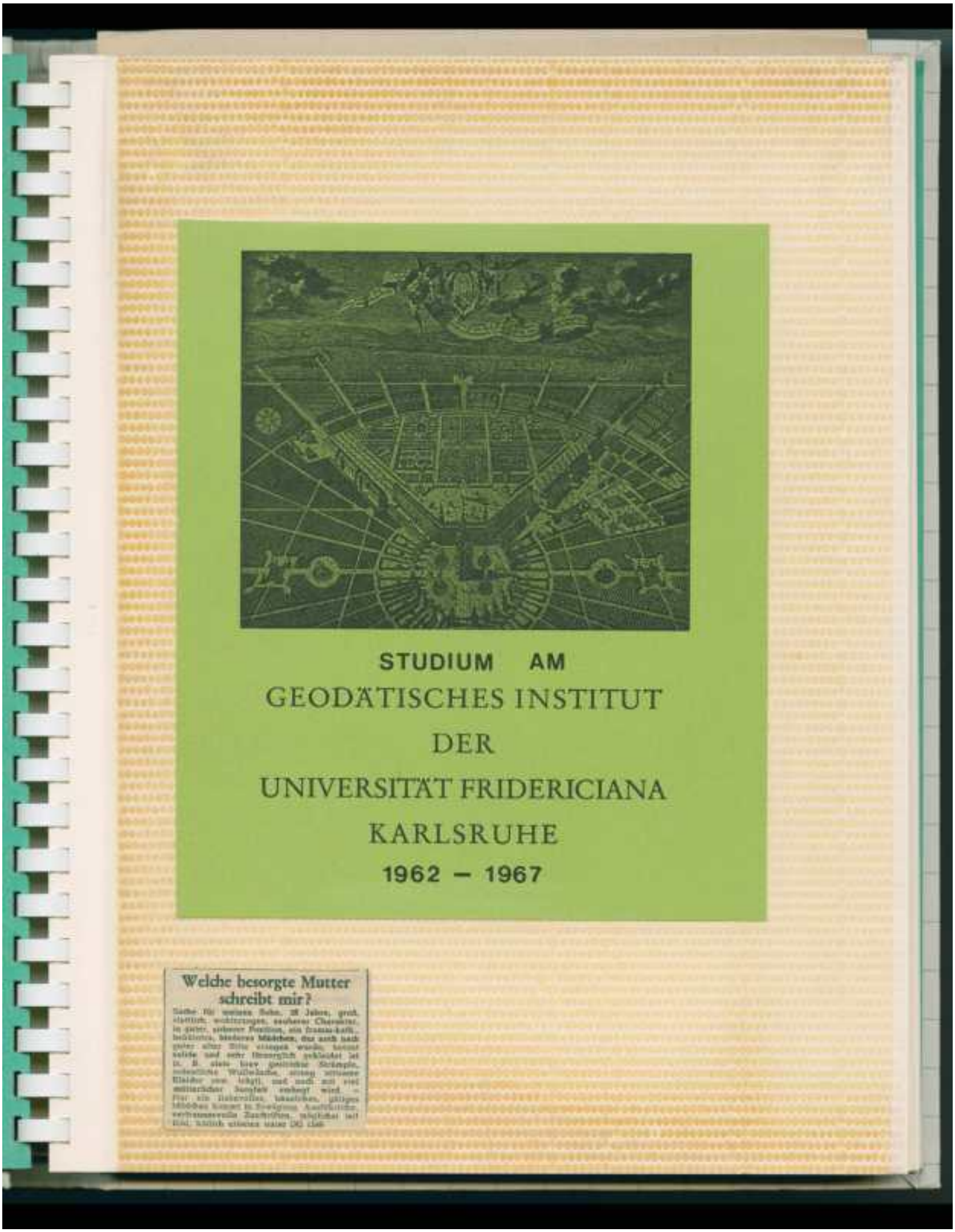
↩ 031

014 School-Leaving Certificate (1831)

"… and not unsuccessfully." — Thus the assessment by Wilhelm Ludwig Volz (1799–1855), professor of mathematics and mechanical engineering at Karlsruhe Polytechnical College about the progress of the pupil Heinrich Sprenger. Some of the other predicates, ten in total, in Sprenger's report are equally glowing. The document was created over five days in successive entries on a pre-printed form with the institution's name at the top. The handwritten entries by the lecturers described their teaching content and, as with Volz, provided information on a student's progress and, in some cases, on diligence and comportment. Because the entries cover the three school years from 1828/29 to 1830/31, it is possible that this certificate was filled out upon Sprenger's departure from the Polytechnical College. It is also conceivable that Sprenger used this summary to help him find employment before his studies had been completed. This apparently irregular document from today's perspective may not have confused his contemporaries. In the first decades of the Polytechnical College's existence, there were neither final exams nor the option to acquire an academic degree. That only became the norm after the turn of the twentieth century with the introduction of the graduate engineering program, *Diplom-Ingenieur*. Even shortly before then, leaving certificates consisted of a tabular list of courses attended each semester. *kn*

School-leaving certificate from Karlsruhe Polytechnical College for Heinrich Sprenger,
October 15–21, 1831,
24.3 x 34.2 cm.
KIT Archives 29002/1.1.2.

↘ Teaching and Academic Study; Milestones in KIT's History


STUDIUM AM
GEODÄTISCHES INSTITUT
DER
UNIVERSITÄT FRIDERICIANA
KARLSRUHE
1962 – 1967
Welche besorgte Mutter schreibt mir?



Jürgen



Jürgen



→ p.275
↩ 002

HVÜ '64

Die HVÜ II der Geodäten des 4. Semesters beginnt gleichzeitig mit der HVÜ III und dauert 2 Wochen. In der 3. Woche nehmen die Studenten an den schon erwähnten Übungen im Kaisersthl teil.

Die HVÜ II hat im Anschluß an vorgegebene Trig. Punkte zunächst ein Polygonnetz mit Reduktionsmessungen mit laufender Latte zu messen. Pro Gruppe mit 4 – 6 Studenten wird dann ein Gebiet von ca. 200 m × 200 m mit 20 bis 25 Grundstücken, entsprechend der amtlichen badischen Ausweisung, polar und orthogonal aufgenommen. Die Berechnungen werden bis zur Koordinatenbestimmung aller Grenzpunkte im badischen Soldner-System in Formungen ausgeführt, so daß sichergestellt wird, daß alle Anschlüsse innerhalb der amtl. Fehlergrenzen bleiben.

Im anschließenden Wintersemester werden die Vergleiche der verschiedenen Verfahren durchgeführt, außerdem die Katasterpläne und die Grundstücksflächen zeichnerisch und halbgraphisch bearbeitet.







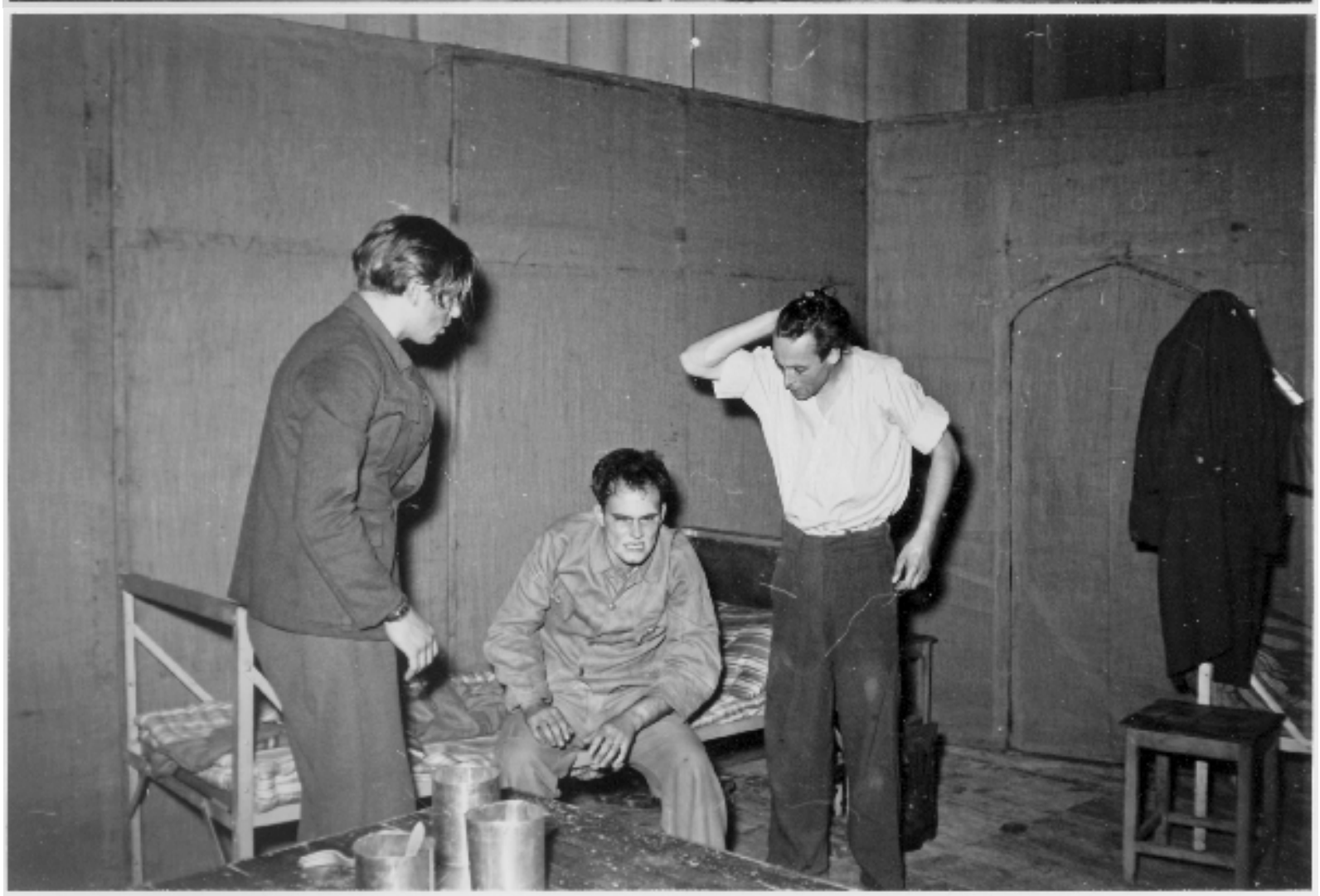
Jürgen vor seinem Zelt

Theater Poster 1955



→ p.275





060 Karlsruhe Nuclide Chart as of 1958



198

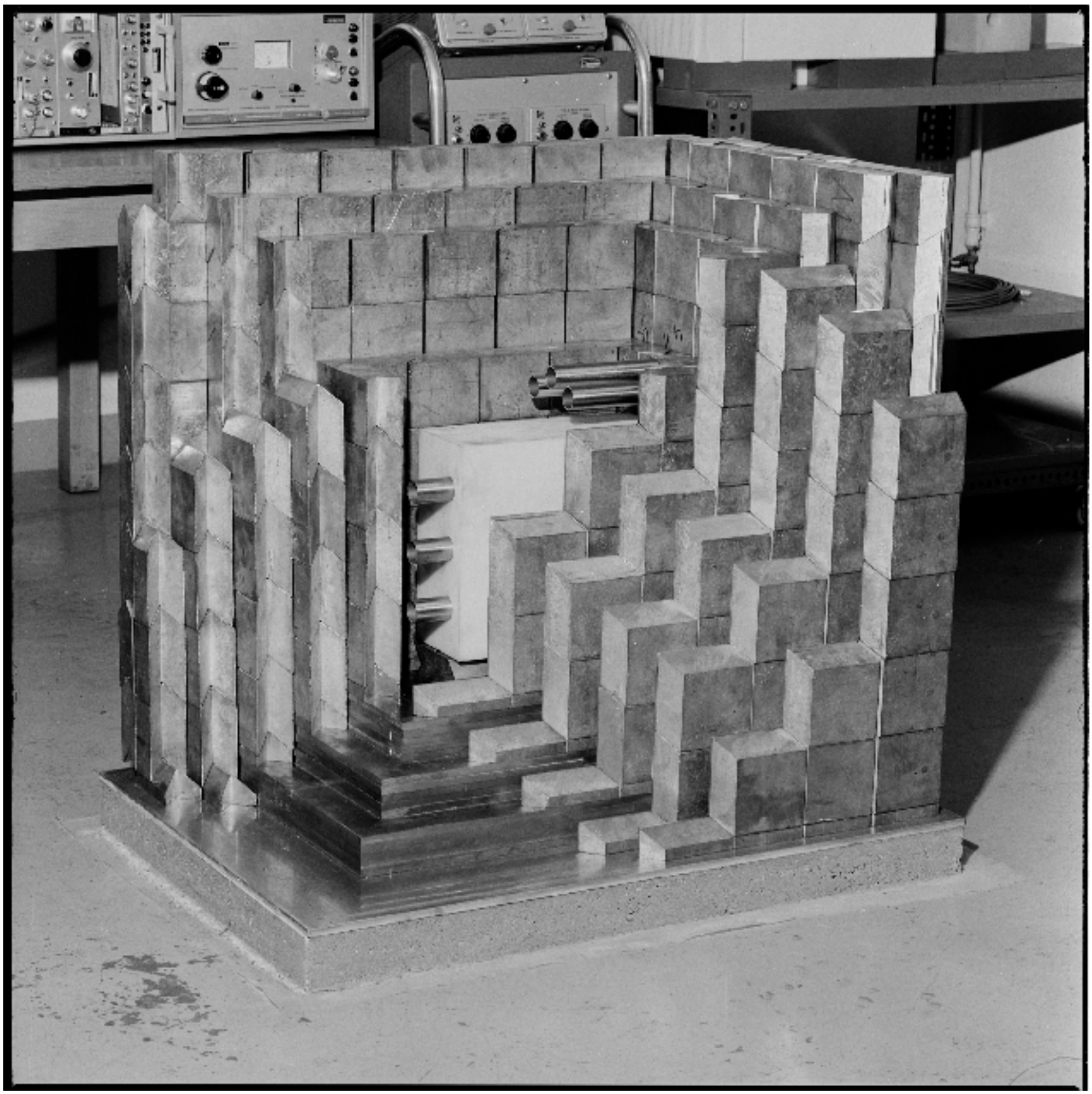
→ p.277



061 Karlsruhe Standard Brick ca. 1980



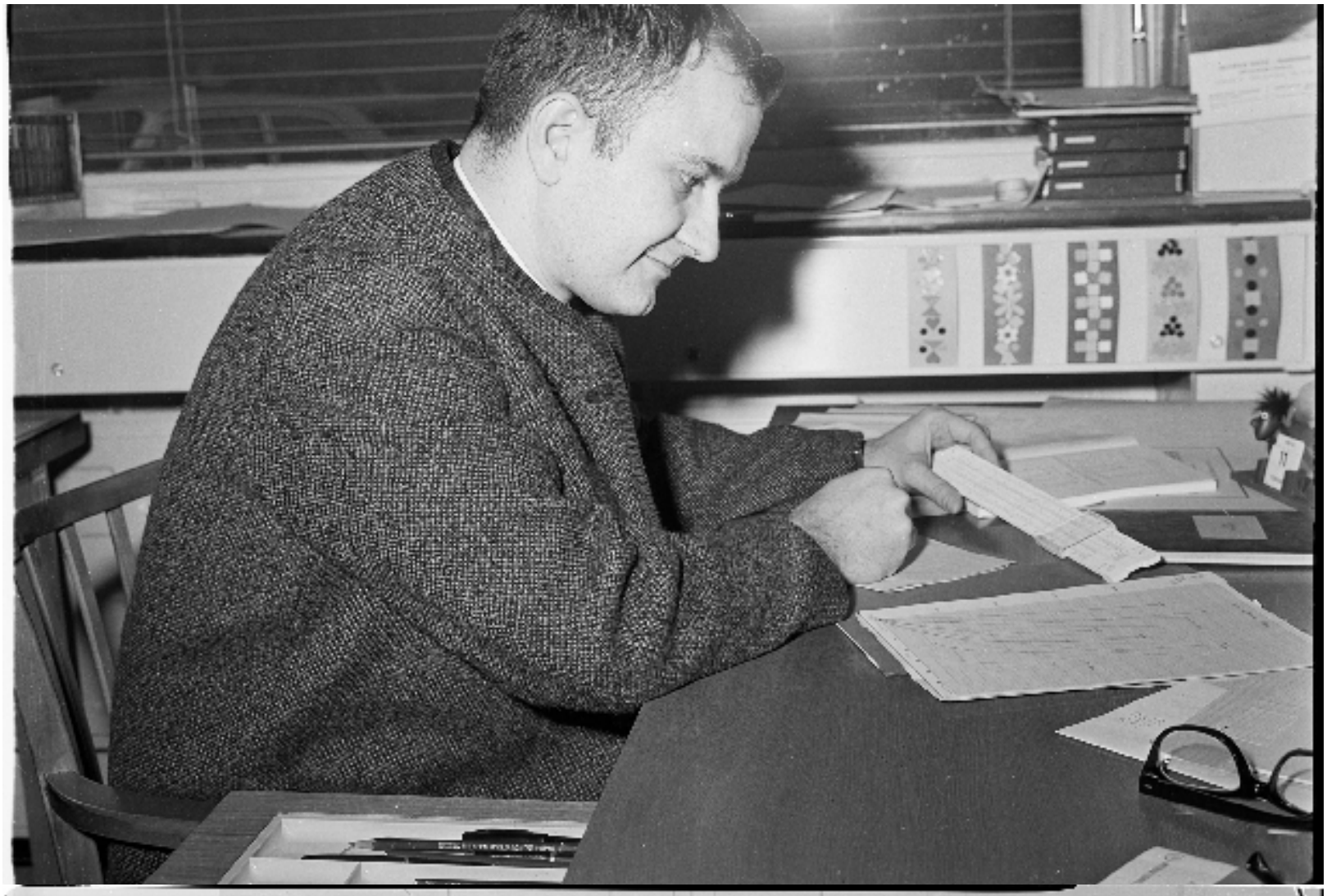
→ p.278



062 Radiation-Protection Slide Rule 1958

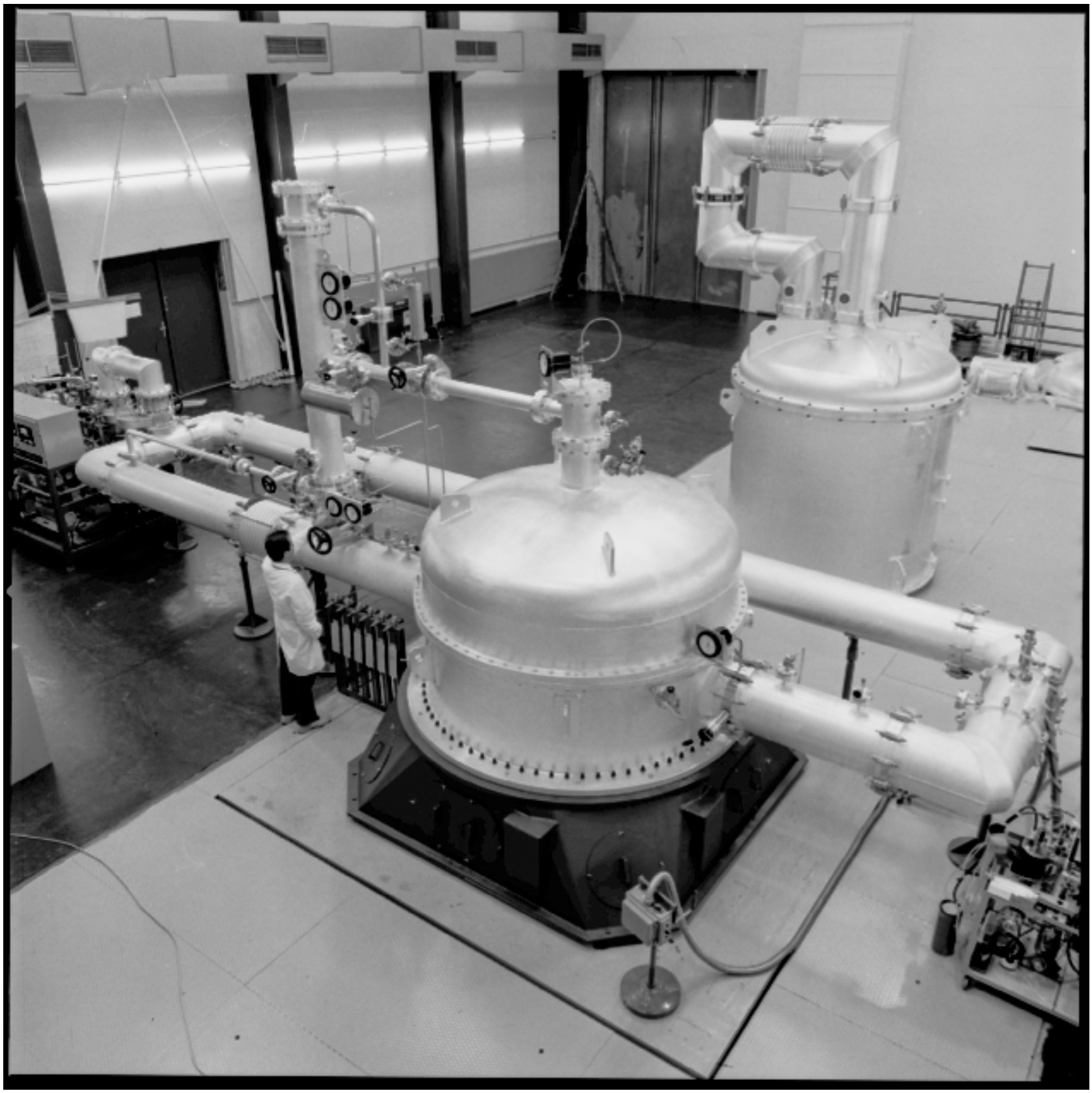


→ p.279

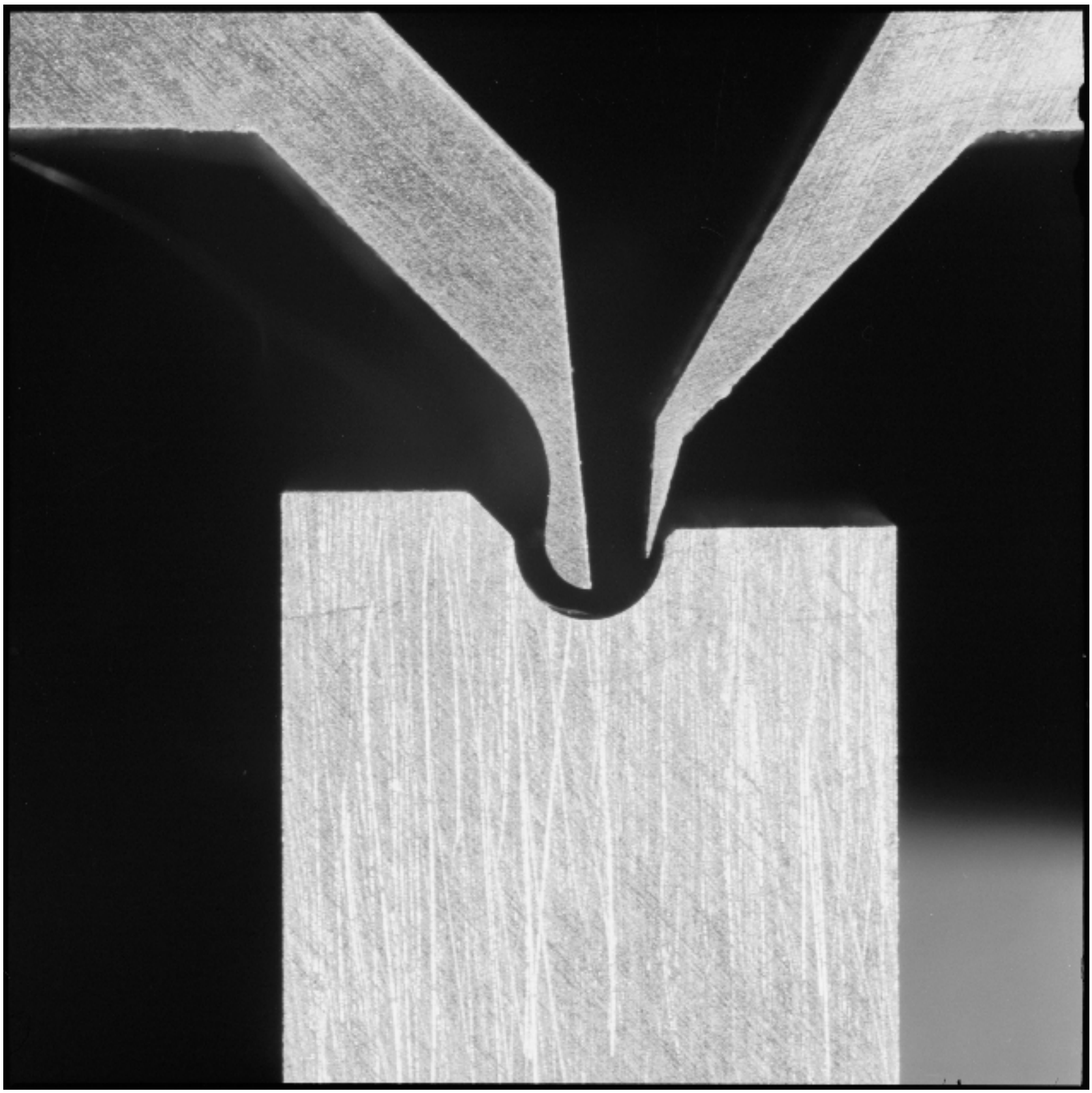




063 Separating Nozzle for Uranium Enrichment 1969



→ p.279
↳ 069



Canine Unit Pennant ca. 1980

→ p.280
↩ 008



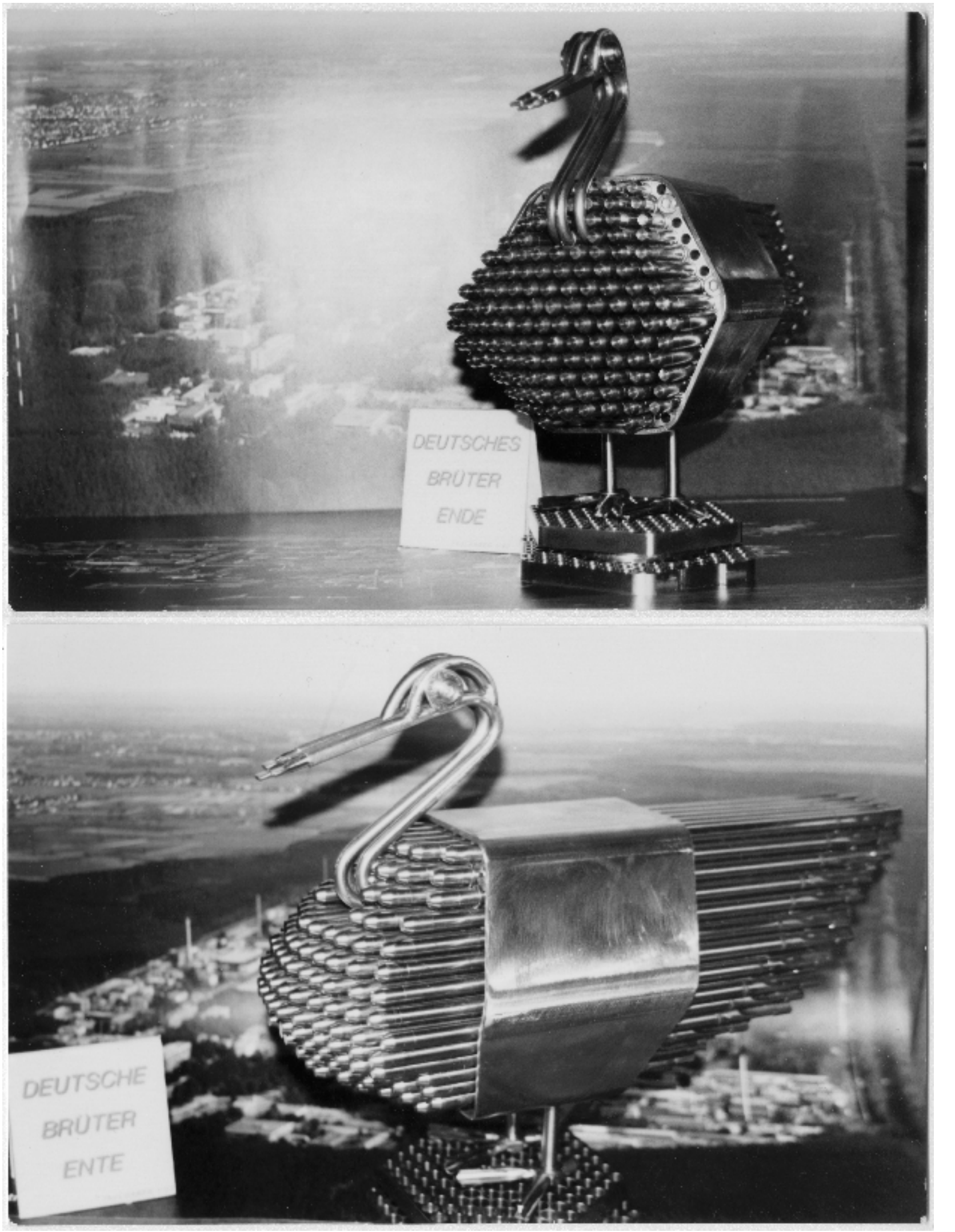
065 Fish Knife ca. 1960

→ p.280
↩ 039



066 Breeder Duck 1991

→ p.281
↩ 008; 029
↪ 067; 072



015 File on a Strike by Polytechnicians (1848)

The volume of files on display here documents the impact on Karlsruhe Polytechnical College of the unrest in Baden during the revolution of 1848. In March 1848, 192 of its pupils petitioned the Second Chamber of the Baden Assembly, demanding that the college's technical schools be transferred to one of the state universities. They had been calling for fundamental changes in Karlsruhe. They issued a list of grievances opposing the rules of conduct and calling for the dismissal of certain teachers; the introduction of private lecturers and a broader range of courses; the establishment of a central school library; and reforms toward adopting university-style institutional self-governance.

In April 1848, unrest in the Grand Duchy reached its first climax with the uprising led by Friedrich Hecker. Just two weeks after the military put down the Hecker march, students in Karlsruhe publicly displayed their concerns. On May 6, many of them demonstratively moved away to Ettlingen, "to defy concessions" — according to Carl Heinrich Albert Kayser (1798–1870), director of the Polytechnical College at the time. This type of student strike had been a common means of exerting pressure at universities for centuries. This campaign at the Polytechnical College did not meet with immediate success. Following the government's instructions, the school management threatened the protesters with expulsion. Most soon returned to class, some only after the deadline had passed. By readmitting upon request those who had joined the exodus, the first student revolt in Karlsruhe came to an unspectacular end. Some of the demands made in 1848 were eventually met, albeit in some cases with a considerable time lag of twenty years. The introduction of the status of private lecturer, for instance, occurred in 1868. *kn*

File on the exodus of students from Karlsruhe Polytechnical College to Ettlingen,
1848–1849,
30.5 × 22.0 × 1.7 cm.
KIT Archives 10001/326.

↘ Teaching and Academic Study;
Milestones in KIT's History

↳ 074

016 Matriculation Roster of Karlsruhe Polytechnical College (1852–1859)

This weighty volume contains student enrollment lists. Such registers had been central to university administration since the Middle Ages. In classical universities of pre-modern times, enrollment conferred academic citizenship and membership in a corporation separate from the city and other legal communities. Universities even had their own courts where members had to be sued by outsiders. However, none of these characteristic privileges existed at Karlsruhe Polytechnical College when it was founded in 1825. Instead, the names of pupils entering the school were meticulously recorded in rosters kept by the school's administrative staff.

This practice changed with the 1852/53 academic year when students were required to enroll themselves in their own handwriting on lists laid out on several counters at the beginning of each semester. By formally adopting such academic customs, the intention may have been to appease students interested in their Polytechnical College developing into a university. These bound enrollment lists in volumes covering several years of school operations can be seen as an expression of institutional self-esteem. Although such fat volumes combining many different lists are less research-friendly, they are clearly more respectable than a pile of loose notebooks. *kn*

Matriculation Roster of Karlsruhe Polytechnical College,
35.4 × 22.5 × 7.0 cm (waste-paper-lined spine broken).
KIT Archives 21003/1.

↘ Teaching and Academic Study;
Everyday Life and Culture;
Milestones in KIT's History

017 Painting "Hohentwiel bei Singen" (1858)

The painting of Hohentwiel mountain is by Ferdinand Redtenbacher (1809–1863). Redtenbacher taught mechanical engineering at Karlsruhe Polytechnical College and served as its director from 1857 to 1863. He played a pivotal role in establishing the Mechanico-Technical School in 1847, which later evolved into KIT's Department of Mechanical Engineering. His efforts in shaping the curriculum made the Polytechnical College a major attraction for students from across Europe and beyond by around 1850.

Redtenbacher's teaching approach emphasized a solid foundation in mathematics and the use of models

and blackboard drawings in lectures to illustrate construction principles. He deeply valued "the cultural development of the industrial public in general," toward improving the social status of engineers through education in history and literature. ↗ 132 This broader educational perspective was influenced by his personal interests in philosophy, literature, and painting. His painting *Hohentwiel bei Singen* exemplifies Redtenbacher's artistic interests. The castle on Hohentwiel mountain is a setting in the historical novel *Ekkehard* by Victor von Scheffel, published in 1855, and according to the inscription on the back of the painting frame, this literary work was the inspiration for Redtenbacher's work of art. *kn*

Ferdinand Redtenbacher:
Hohentwiel bei Singen,
41.7 × 32.9 × 3.3 cm,
oil painting on cardboard.
KIT Archives 28501/18.

↘ Teaching and Academic Study;
Everyday Life and Culture

↩ 018; 019

Redtenbacher's Work in the Context of Intellectual History

Ferdinand J. Redtenbacher devoted great effort to developing the underlying theory of mechanical engineering, as his body of work demonstrates. His high level of technical insight earned him the distinctive title of "founder of scientific mechanical engineering." This theoretical advancement of mechanical engineering as a science, with its decidedly innovative character, also invites consideration of his underlying philosophical views, which may have influenced his approach to technology. Biographical sources suggest that Redtenbacher was deeply interested in the philosophy of his time, dating back to his student years in Vienna, when he was under twenty. At that time, Immanuel Kant's latest works were on the index of banned books. However, this did not deter Redtenbacher and a circle of his peers from acquiring and studying these works in secret — an act that could have led to severe imprisonment. ↗ 133 Notes on his life reveal that he continued to study philosophy, especially from the Age of Enlightenment, to the end of his days. The writings of thinkers of that period not only captivated him but likely also influenced his reflective thought.

Redtenbacher's affinity for Kant's philosophy, which was highly influential at the time and explored paradigm shifts, was grounded in the call to "use one's own understanding" and "free oneself from self-imposed immaturity" ↗ 134 This suggests that Redtenbacher likely applied these principles to practical fields such as technology. The integration of empirical knowledge into a theoretical scientific system, structured around *a priori* forms of thought, is a key aspect of Enlightenment thinking.

There are indications that Redtenbacher was also influenced by Wilhelm von Humboldt's educational theory, which centered on a foundation in philosophical knowledge. Redtenbacher's approach in Karlsruhe reflects this, as he integrated philosophy and other subjects in the humanities into the study of technology, particularly mechanical engineering. ↗ 135 This inclusion of broader teaching content highlights his deep interest in society, as encapsulated in the surviving quote: his "endeavors as a teacher … were not only focused on the theory of machines," but also on the "cultural development of the industrial public," which was equally important to him. ↗ 136

Redtenbacher's humanistic outlook is also evident in his ethical and social commentary. For instance, he lamented the absence of a "humane standpoint" in "industrial activity." ↗ 137

The ideals of the Age of Enlightenment were closely tied to significant social upheavals and indeed revolutions in many countries during that period. This culminated in the attempt to establish a new democratic order through the Frankfurt National Assembly in 1848–49. Redtenbacher was nominated to represent his hometown of Steyr at the assembly, likely due to his convictions, but he ultimately declined the delegation.

Even these few references reveal that the intellectually so gifted Redtenbacher engaged deeply in the scientific and theoretical reflections of this pivotal philosophical and social era, applying them innovatively to his field.

His philosophically inspired approach, which prioritized human reason over a purely empirical-mechanistic understanding of knowledge, is perhaps best encapsulated in the quote handed down on a print of his portrait: "Wherever something stirs, mechanics is involved; but minds do not stir through mechanics." ↗ 138

Enrico Savio

018 Model for Teaching Mechanical Engineering (ca. 1850)

It may look clumsy — but it does move. Models like this were important teaching aids in the mechanical engineering program established by Ferdinand Redtenbacher (1809–1863) at Karlsruhe Polytechnical College since 1841. His innovative approach became the foundation of mechanical engineering as a separate scientific discipline. A key focus of his was, to minimize the effort required to develop machines by calculating forces and material strengths. He saw this as a means for the Continent to compete with British industry. Redten-

bacher's mechanical engineering course in Karlsruhe initially offered two years of training in the foundations, with strong emphasis placed on mathematics. This was followed by two years of specialized training. From 1847, the last mentioned courses were offered at a dedicated technical school, marking the beginning of what would become KIT's Faculty of Mechanical Engineering.

The demonstration models acquired by Redtenbacher, along with other model collections, became a hallmark of quality for the Polytechnical College. William Barton Rogers, founder of MIT, referred in a report on Karlsruhe Polytechnical College to "an extensive museum of mechanical models of all conceivable mechanical combinations" that he had visited. ⁄ 139 The models were part of a multimedia exhibit. Redtenbacher's actual lecture material was supplemented by blackboard drawings from his own hand and even acoustical imitations of machine noises. This form of teaching attracted students from all over Europe. *kn*

Gear model for non-uniform periodic motion transmission by means of non-circular gear wheels,
ca. 45.0 × 30.0 × 20.0 cm,
cast brass and iron.
KIT Department of Mechanical Engineering, Redtenbacher Collection.

↘ Teaching and Academic Study; Milestones in KIT's History

↩ 010; 017; 019; 020; 023

019 Transcript of a Mechanical Engineering Lecture by Ferdinand Redtenbacher (1856-1857)

In 1841, Ferdinand Redtenbacher (1809–1863) joined Karlsruhe Polytechnical College and established a new approach to teaching mechanical engineering based on his own ideas. Today, his innovations are considered the scientific foundation of the field. His teaching revolved around lectures. He used notes on the blackboard to demonstrate the necessary calculations and illustrated machines and their components with quick chalk sketches. Movable models were also employed to demonstrate mechanical functions.

To ensure that the teaching content be retained, students had to quickly jot down what they heard and saw during lectures and then in later revision make detailed fair copies. These copies were what were studied at home. This process required not only legible writing and precise language but also adequate drawing skills to sketch the occasional colorful illustration. In addition to attending and studying the lecture material, students performed design exercises to apply what they had learned. Lecture notes and practical drawings preserved in the KIT Archives demonstrate that these articles were kept long after they had served their academic purpose. *kn*

Ferdinand Redtenbacher: Maschinenbau,
1. Curs,
transcript by Carl Wenger ,
23.0 × 28.6 × 2,5 cm,
half-leather binding.
KIT Library III E 487/1.

↘ Teaching and Academic Study

↩ 017; 018; 023

020 Mathematical Thread Model (1887)

"Descriptive geometry forms the basis of the entire education in graphics at the Polytechnical College," this according to the school's program from 1840. Over a period of two years, students were taught the fundamentals and skills of descriptive geometry in a series of courses. This specialized mathematical field focuses on the geometrical and constructive methods for projections of three-dimensional objects onto a two-dimensional plane. Practical courses complemented the theory, in which students built models based on mathematical textbook problems to visualize surfaces, curves, and sections described in theoretical terms.

KIT has a collection of these thread models from the 1870s to the 1910s. Labels on some models indicate the specific problems and textbooks involved, with frequent references made to Christian Wiener's textbook on descriptive geometry (1884–86) and Karl Rohn's textbook dedicated to this branch of geometry (1901).

Today, the tasks once solved by means of descriptive geometry are largely performed by computer. As a result, the focus of study has shifted toward mastering Computer-Aided Design programs and using them to solve complex problems. *as, kn*

Model of the 3rd-degree Cayley plane,
maker: Bartholomeus Hendriks,
ca. 42.0 × 32.0 × 27.2 cm,
plywood, textile threads, paint.
KIT Archives 28508/12.

↘ Teaching and Academic Study

↩ 010; 018

Modern Models

Under the guidance of their teacher Christian Wiener, students at Karlsruhe Polytechnical College attended practical courses on models. Wiener was professor of descriptive geometry in Karlsruhe since 1852. In this subject, aspiring engineers learned how to design buildings and machines. It was a permanent part of basic mathematical education at technical educational establishments in the 19th century. The Karlsruhe models share a very distinctive style, varying in form and material with maker. Some models are made of wood, strung with threads, others have a metal frame. Some are filigree in design and remind one of Art Nouveau decorations, others rather resemble pieces made by a carpenter's apprentice with functional frames. Many models bear the names of their makers — there is really no need to specify the gender here, because in this period students were without exception male.

Seminars on making mathematical models were a typical component of technical courses of study during the 19th century. These courses served as exercises in geometric planar and orthogonal perspective, that is, the transposition of a three-dimensional object onto a two-dimensional drawing and vice versa. Very different materials were used in the process. Some models were molded by hand out of plasticine and subsequently cast in plaster; others were turned wood or were built of interlocking pieces of cardboard. Each material determined its own building technique. Models made of thread with a metal or wooden frame were made using ready-made templates.

Thread models like the ones in the Karlsruhe collection first evolved in Paris around 1830. The idea of depicting second-order surfaces by means of a metal frame with threads strung inside it originated from the mathematician Théodore Olivier, professor of descriptive geometry and cofounder of the *École Centrale des Arts et Manufactures*. Olivier wanted to train modern engineers, in other words, ones who knew how to find answers to the challenges of the industrial age. They had to work with materials that were also used in industry, for instance, metal or else glass and cement. In the collection that Christian Wiener had assembled, there were models not only of metal and thread, but also of entirely different materials, such as wood and plaster. His son Hermann Wiener (1857–1939) specialized himself wholly in models of one particular method of production. Hermann Wiener had studied with his father for two years in Karlsruhe, attending the model-building practical sessions and thus had learned how to depict second-order surfaces spatially. For that he exclusively used brass wire and silk threads.

These wire and thread models, made up to the 1910s, were also considered "modern" because they were quite different from the material regularly used in model building: plaster, which by then was considered outdated. Consequently, thread models can be seen as modern in two respects. On one hand, with regard to the new challenges posed by industrial modernity, and on the other hand, for aesthetic reasons. One material (wire or metal) was superseded by another (plaster, cardboard) because of new conceptions about aesthetics and functionality. Hermann Wiener deemed plaster inferior because it replicated a geometrical surface too imprecisely. He expected a model to be simple and clear — which metal and threads could achieve particularly well. The possibility of expressing mathematical properties of a model by specific materials is characteristic of three-dimensional models. They cannot be realized in a computer and that is the intrinsic value of mathematical collections even now. ↗140

Anja Sattelmacher

021 Lantern Slide from Bruno Meyer's Publishing House (ca. 1885)

In 1874, art scholar Bruno Ludwig Julius Boguslaus Meyer (1840–1917) was appointed professor of art history, which subject had been established at Karlsruhe Polytechnical College in 1868. Originally from Berlin, Meyer had a longstanding interest in photography and quickly recognized the advantages of the new technology called sciopticon, an early predecessor of the slide projector. This innovation allowed images to be shown to the whole audience simultaneously during lectures, eliminating delays caused by passing around graphic and photographic reproductions. Among elite circles of art historians, however, such advances met with disapproval.

Upon his appointment to Karlsruhe, Meyer promoted his idea and began to build up a collection of photographic images from his own resources. By 1880, the Polytechnical College enabled him to set up a lecture hall equipped with a projector and all the necessary apparatus. In 1883, Meyer responded to the demand for art slides by establishing his own publishing house. However, an audit revealed that Meyer was financially profiting from this venture, which he denied, leading to a dispute between Meyer and his employer. In 1884, Meyer requested to be released from the Baden civil service. He returned to Berlin, where he successfully advocated for the modernization of copyright law for "products of photographic technology" at the turn of the century. ↗141

Just a few years later, lantern slide projections had become an integral part of art history classes. The resulting slide libraries of art history institutes continue to be a central component of the teaching apparatus.

The image collections from these lantern slide libraries are being digitized since the 2010s and made available to students and researchers through online databases. In many instances, the term “Diathek” (slide archive) is still retained. *as*

Lantern slide of a graphic reproduction of
Titian’s *La Bella* (1536),
published by Bruno Meyer,
8.5 × 10.0 × 0.2 cm.
KIT Archives 28002/872.

↘ Teaching and Academic Study; Innovation; Everyday Life and Culture

The Lantern-Slide Presentation as a Medial Innovation

In late 1880, Bruno Meyer began using a sciopticon to illustrate lectures at Karlsruhe Polytechnical College, thus introducing art-historical photographic lectures into academic teaching. In 1883, he published a catalog of glass slides — a directory of 4,000 glass photograms for art history instruction. Considering the state of photography at the time, and the challenges of photographic slide projection, in particular, it was no small feat to utilize it. Early photography struggled with orthochromatic color reproduction, making it difficult to reproduce paintings. Additionally, the photomechanical reproduction of photographic originals was complicated. For projection purposes, slides also required high lightfastness and contrast. Meyer, who was busy all at once as full professor, photographer, and image publisher during this project, specialized in the intricate process of carbon printing, resulting in sepia-toned images on 85 × 100 mm glass slides. The nine glass photograms preserved in the KIT Archives are like a time capsule, capturing the limitations of early photography. To avoid issues with tonal value reproduction, Meyer photographed paintings from engravings, thereby transferring the older reproduction medium into a new technical process. This is particularly evident in the Karlsruhe collection, which contains slides of Titian engravings. Combined with the index detailing the collection’s distribution across different epochs, the Karlsruhe glass photograms are not only historical documents of photography but also artifacts of the evolution of the media in art history and the nineteenth-century teaching canon. Materially, these artifacts are notable for the visible traces of manual work, highlighting the experimental nature of the project. Beyond their object-specific characteristics, Meyer’s pioneering work also represents a significant intervention in university infrastructure. The newly acquired projector and the installation of dimmable gas lighting were designed to establish a new media disposition, one that would have a lasting impact on art history and academic practice. ↗ 142

Maria Männig

Karlsruhe Polytechnic up to World War I (1885–1914)

022 Research into Electromagnetic Waves by Heinrich Hertz (1886)

Nowadays, life without a smart phone, portable computer, and countless other wireless communication devices is hardly conceivable anymore. Wireless telegraphy, radio, and television were already shaping the era during the twentieth century. Heinrich Hertz (1857–1894) had set the stage with his research in Karlsruhe into the nature of electromagnetic waves. In 1885, this young private lecturer accepted his first professorship at Karlsruhe Polytechnic, where he had the opportunity to conduct experiments. During Hertz's tenure at Karlsruhe, student enrollment was exceptionally low, due to the economic crisis known as the Great Depression, which started in 1873 and persisted into the 1890s. In November 1886, Hertz artificially generated a spark not in a laboratory, but in the main building on Kaiserstraße in a lecture hall now named after him. He successfully detected the electromagnetic pulse emitted into the air a few meters away, creating a wireless transmission between a transmitter and receiver.

Hertz focused solely on basic research and showed little interest in practical applications. It wasn't until the mid-1890s that radio technology began to be used in communications by Hertz's predecessors on the Karlsruhe chair, Ferdinand Braun and Guglielmo Marconi. Both received the Nobel Prize for their work in 1909. Hertz had already died of blood poisoning in 1894 at the age of 36. However, in 1930, the physical unit for oscillation frequency was named after him. Nearly every electrical device used in daily life now bears Hertz's name with the indicated alternating current frequency "50 Hz" required for its operation. *kn*

The apparatus Heinrich Hertz used to investigate electromagnetic waves:
(far left) a spool-shaped Rühmkorff spark coil as voltage source, (center) the air gap between two aligned spheres for the spark to traverse, (right) the wireless receiver of the signal generated by the jumping spark.
Photograph after 1886, unknown photographer.
KIT Archive 28010/I 3152 (reproduction of an original in Deutsches Museum, Munich).

↘ Research; Innovation

↩ 046

Freedom of Research 140 Years Ago

That electricity and magnetism are interrelated was already known from observations in the mid-nineteenth century. Scientists were only debating about how. One key controversial issue was whether the effect occurred instantaneously, like a lever's action regardless of distance, or whether it propagated as a wave at a finite velocity. James Clerk Maxwell formulated his fundamental equations of electromagnetism in 1864 but could not prove their validity. Heinrich Hertz had been studying electromagnetism already as Hermann von Helmholtz's assistant at the University of Berlin. After two years in Kiel, at the age of 28, he saw an opportunity to pursue his favorite research focus at Karlsruhe Polytechnic as successor to Ferdinand Braun. Only there did he gain access to essential instruments — primarily from Braun's laboratory — and a sufficiently spacious facility was made available to him that is now called the Hertz lecture hall. Using his refined and newly developed equipment (spark inductor, Hertzian dipole, etc.), he proved within just three years the existence of electromagnetic waves and elucidated numerous related phenomena, which his many acclaimed detailed publications document.

Heinrich Hertz was undoubtedly brilliant; one might ask, however, whether such a career trajectory would have been possible in our current academic environment. Hertz completed his physics studies and doctorate in under three years and secured a professorship just five years later at Karlsruhe Polytechnic. He spent his four most productive years conducting hands-on laboratory research there in addition to his teaching load. One wonders if such an achievement would be feasible in an era of accreditation programs, reduced funding, and extensive bureaucracy.

Had he not died in 1894, Hertz would certainly have received the Nobel Prize but that award only existed from 1901 on. If there is an even greater distinction for a scientist, then it is, becoming the namesake of a physical unit. In this sense Heinrich Hertz is certainly the most famous former member of Karlsruhe Polytechnic resp. KIT.

Thomas Zwick

023 Drawing Exercises by a Civil Engineering Student (1891–1893)

Producing technical drawings, like those shown here, was an important part of studying at Karlsruhe Polytechnical College and the later Polytechnic. Students developed these skills in courses in such various subjects as *freehand drawing*, *plan and terrain drawing*, or *lighting theory and perspective*. They also engaged in extensive exercises in descriptive geometry; and calligraphy to head such drawings was also part of the curriculum. This training was a common requirement across engineering disciplines, including architecture. The civil engineering student Ferdinand Lehn (born 1871) had the architectural drawings he had made between 1891 and 1893 bound into an elegant half-leather volume, indicating the lasting value he attached to these exercises. His drawings provide an overview of subfields within civil engineering: bridge construction, railroad construction, hydraulic engineering, road construction, and surveying. The curriculum also included related disciplines like architecture and mechanical engineering.

The professors in the civil engineering department at the time also figure on these pages with their distinctive marks attesting a student's performance: Reinhard Baumeister (1833–1917) in urban planning; Friedrich Engesser (1848–1931) in bridge and railroad construction; Matthäus Haid (1853–1919) in surveying; and Kosmas Sayer (1851–1899) in hydraulic engineering; as well as the architect Adolf Weinbrenner (1836–1921) and the mechanical engineer Karl Keller (1839–1928). *kn*

Ferdinand Lehn: Drawing exercises from his studies in civil engineering at Karlsruhe Polytechnic,
67.9 × 43.5 × 4.0 cm,
half-leather binding.
KIT Archives 28016/31.

↘ Teaching and Academic Study

↩ 010; 018; 019; 020

Drawings in Engineering

Ferdinand Lehn's album illustrates the breadth of civil engineering studies in the 1890s. It includes typical engine-element designs alongside localized planning projects for a mill canal or a railroad line. The representation techniques range from sectional drawings and geometric analyses of static phenomena, to shaded building elements and colored landscape depictions. Wood, quarry stones, bricks, vegetation, water, and stratified soil are all meticulously reproduced. But human figures are nowhere to be seen, not even as decorative additions.

Lehn's drawings document the significance of infrastructure projects at the height of industrialization. Apart from omnipresent railroad construction, "river correction" also played an important role, extending far beyond the major channelization project of the Rhine. The reduction of travel times on the then-still-established stagecoach routes through constructing new road bridges also features prominently, smoothing the way for the later transition to motorized road traffic.

By the time Lehn compiled his album in the late nineteenth century, technical drawings had long been established as a medium. Whilst known since antiquity, they still played a minor role in medieval cathedral construction. Their widespread use in Central Europe in-

creased with the introduction of rag paper around 1400, hence predating the establishment of "modern" techniques of perspectival representation. The affordability of paper compared to animal-skin parchment was a key factor. Leonardo da Vinci's ingenious skills at all levels soon elevated technical drawing to new heights. Even for Leonardo's engineering contemporaries, drawings began to serve various functions: from sketches of buildings on travels, to elaborately presented client proposals, and technical treatise illustrations. When the first training schools for civil and military engineers emerged, drawing became a core part of the curriculum. Collection holdings similar to Lehn's album, from renowned eighteenth-century French engineering schools have also been preserved.

Not just the viaduct project shown here, but other pages of the album as well thus illustrate how drastically the required skills for (construction) engineers have evolved. Keyboard typing and screen scrolling have long since replaced the less forgiving use of brush and pen. If drawing by hand remains part of engineering training at all, it is on the hope that such a "haptic" practice may still foster specific cognitive skills in modern design. Lehn's memento thus demonstrates that not only technology changes over time, but also what can be described as the history of knowledge in the engineering profession — shaped then, as it is now, by current media possibilities and the individual mastery of them.

Marcus Popplow

024 Polarizing Microscope from Liquid Crystal Research (ca. 1890)

The polarizing microscope from the physicist Otto Lehmann's (1855–1922) estate was once the centerpiece of an extensive research environment at Karlsruhe Polytechnic. It played a key role in fundamental research on liquid crystals. In 1888, a letter from his colleague Friedrich Reinitzer informed Lehmann about the first observation of the liquid crystals phenomenon. This fascinated him so much that he devoted the rest of his scientific career to pioneering researches in the field. In Lehmann's time, the term "liquid crystal" was almost provocative, as it juxtaposed the contradictory concepts of a crystal as a solid and a liquid as a flowing substance. Lehmann risked his scientific reputation in attempting to convince initially skeptical experts that certain substances have a liquid-crystalline phase between the solid and liquid aggregate states, in which they flow while also exhibiting regular, crystalline structures. But the future potential of controlling the optical properties of liquid crystals with electrical voltage and taking this as the basis for creating viewing screens was not yet foreseeable. Lehmann's primary interest lay in identifying substances with liquid crystal properties, observing their behavior, and presenting his findings to both the scientific community and the public at large. He used microscopes with rotatable specimen plates to examine the optical responses of preparations in polarized light. He also used refined heating devices to heat up and cool down specimens under controlled conditions. Lehmann even built some of this specialized equipment required for his microscopic work himself and provided for photographic documentation of his preparations. In this way, Lehmann combined the now often disjunct roles of scientific theorist, laboratory technician, and scientific communicator. *kn*

Polarizing microscope,
30.0 × 10.0 × 16.0 cm,
maker: Voigt & Hochgesang/Göttingen,
and Seibert/Wetzlar,
brass etc.,
KIT Archives 27059/160.

↘ Research; Innovation;
Call for Objects

Object proposal

The crystallization microscope with temperature equalization and polarization apparatus, which Otto Lehmann spent years consistently improving, was the only efficient instrument available that was ideally suited to examine the phenomena that Reinitzer had observed in cholesteryl benzoate.

Michael E. Becker

From the Carrot to the Flat Screen …

This phrase succinctly captures the complex and challenging journey of liquid crystals, from the early careful observations by the botanist Friedrich Reinitzer, to current advancements in screen technology.

In the midst of investigating the two melting points of cholesteryl benzoate — a cholesterol derivative he discovered in carrots — and its temperature-dependent coloration in polarized light, Reinitzer reached out to Otto Lehmann, at that time still a private lecturer (Privatdozent) in Aachen, in March 1888. He requested Lehmann to "kindly examine" more closely the enclosed samples using his crystallization microscopes. ⁄ 143

Lehmann had been acquainted with microscopy since his school days through his father and had received advanced training in crystallography at Strasbourg University under the mineralogist Paul Heinrich von Groth. In his dissertation of 1872 he had already described how to adapt the microscope to observe crystallization phenomena by adding a gas burner for heating and an airflow system for cooling the specimens. By 1888, Lehmann's numerous publications proved him to be an established expert in microscopic crystallography, with extensive experience and the necessary instruments.

After moving from Aachen to Dresden and then, upon his appointment to Karlsruhe as Heinrich Hertz's successor, Lehmann published the results of his investigation of Reinitzer's samples in August 1889. He confirmed Reinitzer's observations and was convinced that cholesteryl benzoate exhibited both liquid and crystalline properties. Although he could not fully explain this state, he described it as "flowing crystals." /144 Lehmann demonstrated that the observed phenomena — multiple melting points and optical anisotropies in the liquid state — were not due to impurities but represented special states of matter (referred to as mesophases by Georges Friedel). He defended this finding vigorously and eloquently for many years against skeptics and mockers.

Starting in 1908, Lehmann sought to disseminate his research results on liquid crystals outside Germany. In 1909, he accepted an invitation to the Sorbonne in Paris to offer an extensive seminar including demonstration experiments. This visit was a great success, laying the foundation for the French school of liquid crystal science, with pioneers such as Charles Mauguin, Georges Friedel, and François Grandjean. In 1904, the Merck company started offering substances with liquid crystal phases in its product line to support scientific research.

Interest in liquid crystals waned in the 1930s due to a lack of practical applications, until in the 1960s, Richard Williams and George Heilmeier in the United States developed the first electrically controlled displays. In 1962, Williams discovered an electro-optical scattering effect in liquid crystals at the Radio Corporation of America's Princeton laboratories, raising hopes by his colleague Heilmeier and, from 1967 on in the firm, for commercial use as large-scale display elements and even as a potential replacement for cathode ray tubes in televisions. With similar enthusiasm, a German chemical manufacturer announced in 1969 that research on "flat television screens would soon be hanging ready on a nail," following the development of a liquid crystal material operable at room temperature. /145

As we now know, these predictions were overly optimistic. The laws of nature presented engineers with numerous challenges that would take at least another thirty years to overcome. Many ideas were turned into prototypes, patented, and tested, but only a few led to practical solutions. The next significant step toward the low-power, high-contrast liquid crystal display (LCD) came from the research department of Hoffmann-La Roche in Basel, Switzerland. Inspired by a publication by Charles Mauguin in 1911, Wolfgang Helfrich developed and patented together with Martin Schadt the twisted nematic (TN) cell on December 4, 1970. Schadt then systematically developed new liquid crystalline substances with the required properties and purity, improving the performance of the TN cell.

The low power consumption and good contrast of TN cells quickly attracted interest from Japanese manufacturers of pocket calculators and wrist watches. Hoffmann-La Roche granted the first licenses for the TN cell as early as 1974. In 1985, Terry Scheffer and Jürgen Nehring at Brown-Boveri in Switzerland introduced the supertwisted birefringence effect, enabling higher multiplex rates and screens with a 640 × 480–pixel matrix. This development paved the way for portable computers. The evolving state of digital electronics at the time was finally matched by appropriate visual display units.

In the early 1990s, the first liquid crystal displays (LCDs) with color display and control by thin-film transistors made of amorphous silicon became available. By the late 1990s, LCDs had begun to be used in offices and other workplaces. In 2008, global sales of LCD televisions equalled those of cathode ray tube televisions for the first time. Since then, large-format flat TV screens have found their place on walls worldwide.

By 2022, global sales of all electro-optical displays totaled around 160 billion US dollars, with liquid crystal displays accounting for more than 90 %. The use of liquid crystals in windows with controllable light transmission, in electrically adjustable optical lenses, in optical data processing elements, and in controllable components for the microwave range, suggests that further advancements in this field can be expected in future.

Michael E. Becker, Henning Wöhler

025 Big Book of Doctorates Awarded by Karlsruhe Polytechnic (1901–1927)

Initiated in 1901, the *Big Book of Doctorates* awarded by Karlsruhe Polytechnic marks a step toward achieving equality between advanced polytechnical institutions and traditional universities. Throughout the nineteenth century, the German polytechnic, the *Technische Hochschule*, had sprouted independently from its own roots. Conventional universities comprised four faculties — the liberal arts (artes liberales), theology, law, and medicine. Polytechnics, on the other hand, focused on mathematics, architecture, civil engineering, chemistry, mechanical engineering, and electrical engineering. As at Karlsruhe, most polytechnics had started out as polytechnical colleges. One important milestone in their evolution into universities was the integration of teaching and research extending beyond mere instruction. These technical institutions acquired university-style organizational structures. One key aspect of academic self-governance was the election of directors and rectors, which practice was also adopted. Additionally, some polytechnical colleges were granted the right to confer habilitation degrees, allowing them to qualify their own young academics for professorships. However, for decades, they were denied the right to confer doctorates — a fundamental qualification for pursuing a career as an academic scientist. In the fall of 1899, after Prussia had paved the way, the technician's doctorate, *Doktor-Ingenieur*, was also introduced in other states of the the

German Empire. The government of the Grand Duchy of Baden quickly followed suit, granting Karlsruhe Polytechnic the right to award doctorates on December 28, 1899. This right was exercised for the first time in 1901, when the chemist Adalbert Engler was awarded the degree of Doctor of Engineering. The binding of the *Big Book of Doctorates*, in large format with a representative half-leather spine — despite its content actually duplicating a simpler doctoral index — reflected institutional acknowledgment of the significance of this new right to confer doctorates. *kn*

Big Book of Doctorates awarded by Karlsruhe Polytechnic,
45.7 × 30.9 × 3.5 cm.
KIT Archives 21013/50551.

↘ Research; Teaching and Academic Study; Milestones in KIT's History

↩ 026; 027; 030

026 Chain of Office for the Rector of Karlsruhe Polytechnic (1902)

Almost concurrently with the granting of the name *Fridericiana*, Grand Duke Friedrich I of Baden also bestowed on Karlsruhe Polytechnic a chain of office for its rector. This gesture was intended to provide a visible symbol of the institution's new university-like ranking following its recently won right to confer doctorates.

A purveyor to the court produced the *Fridericiana's* rectorial chain by commission of the Grand Duke. Three different craftsmen and a company contributed to the creation of this gilded silver chain. Karl Hoffacker (1856–1919), director of the School of Applied Arts and the Museum of Applied Arts in Karlsruhe, had drawn the overall design. Rudolf Mayer (1846–1916), a renowned medalist and teacher at the School of Applied Arts, designed the centerpiece of the chain: a medal featuring the profile of the Grand Duke. This medal was stamped by the B. H. Mayer mint in Pforzheim. The chain itself was meticulously designed and crafted by court goldsmith Nikolaus Trübner (1849–1910). The chain links are adorned with stylized pomegranates, symbolizing power, life, and fertility. These links alternate with ornamental knots, from each of which two fruit-bearing branches extend. Directly above the medal is the provincial escutcheon with a crown crest, also framed by plant motifs. The escutcheon, pomegranates, and branches are enameled in red and green. *as*

Chain of office for the rector of Karlsruhe Polytechnic,
design: Rudolf Hoffacker and Rudolf Mayer,
maker: B. H. Mayer/Pforzheim,
chain length: 88 cm,
medal diameter: 5.8 cm,
gilt silver.
Karlsruhe Institute of Technology, Office of the President.

↘ Everyday Life and Culture; Milestones in KIT's History

↩ 025; 027; 030

027 Memorial Plaque on the Bestowal of the Epithet "Fridericiana" on Karlsruhe Polytechnic (from 1902 on)

"Grand Duke Friedrich of Baden bestowed the honorary name *FRIDERICIANA* upon Karlsruhe Polytechnic during the anniversary celebrations of his 50th year of reign on April 25, 1902." Thus reads a plaque dedicated by the rectorate and senate of the Polytechnic in memory of this privilege "in reverential homage [and] never lapsing gratitude."

The conferral of this honorary name marked the culmination of a significant transformation of the Polytechnic at the turn of the twentieth century. A key milestone was the granting of the right to award doctorates in 1899. The long-sought-after equality with traditional universities had thus been attained. Additionally, a generous building program led to new facilities for architecture, chemistry, mechanical engineering, and the natural sciences, enhancing Karlsruhe's position among competing technical universities.

Naming universities after regents was common practice as a mark of distinction. For Karlsruhe, this step along with the honorary address *"Magnifizenz"* for the rector, and his chain of office, represented a notable enhancement of its public image. The Grand Duke of Baden was pleased with the university's petition to carry the name of its patron, as reveals a handwritten note by Friedrich I on the award decree. This gesture may also have expressed his satisfaction with his long-standing support of Karlsruhe Polytechnic, demonstrating the regent's commitment to educational advancement.

Little is known about the creation of the commemorative plaque. It was produced by the sculptor Heinrich Bauser between approximately 1902 and 1905. It is believed that the plaque may have been originally displayed in the auditorium of the architecture building, which was destroyed in 1944, alongside other plaques of

historical significance. The plaque was rediscovered only in 2005, in storage for decades with other items from the institutional history collection in a janitor's workshop on campus. *as*

Memorial plaque,
design: Heinrich Bauser,
cast: Peters/Karlsruhe,
48.0 × 31.0 × 4.0 cm,
bronze.
KIT Archives 28502/39.

↘ Everyday Life and Culture;
Milestones in KIT's History

↩ 025; 026; 030

028 Photographic Portrait of Magdalena Neff (1906)

German women first received the right to "regular" admission to academic study in Baden, and thus also leave to sit the qualifying examinations. After the admission of women in 1900 Magdalena Meub achieved regular matriculation at Karlsruhe Polytechnic, in the winter semester of 1904/05.

Magdalena Meub, the daughter of master baker Meub, was born on February 9, 1881, in Karlsruhe. In 1893, she entered Germany's first girls' preparatory school, called a *Gymnasium*, in Karlsruhe, and passed her school-leaving exams (*Abitur*) in 1899. Subsequently, she became Germany's first female pharmacy apprentice and successfully completed the assistantship examination. This qualified her for university studies, since the Abitur from the girls' school in Karlsruhe was not officially equivalent to one for boys prior to a decree issued in 1904.

Magdalena Meub studied pharmacy at the Polytechnic until 1906 and passed her state examination with distinction. In the year of her graduation, she married the pharmacist Adolf Neff, and together they acquired the Lion Pharmacy in Ehingen on the Danube, which they ran jointly until 1954.

Magdalena Neff, née Meub, was a pioneer in many respects. As one of the first female high school graduates and Germany's first female graduated pharmacist, she paved the way for many of her successors. She is regarded as the founder of a network of women from which the Association of German Women Pharmacists emerged. *as*

Portrait of Magdalena Neff (née Meub),
photographer: Atelier Oskar Suck,
digital copy of an original in a private collection.
KIT Archives 28010/I 7884

↘ Teaching and Academic Study;
Everyday Life and Culture;
Milestones in KIT's History

↩ 034; 050; 053

On the Introduction of Women into Academic Study in Germany

For centuries it was quite naturally assumed that universities were exclusively responsible for the academic education of young men. When women began approaching German universities in the latter half of the nineteenth century to seek admission to lectures, there were no legal barriers to their participation. However, these women were predominantly foreigners. In Baden, the case of Sofja Kovalevskaja created significant attention. She had applied to attend lectures in mathematics, physics, and chemistry at Heidelberg in the summer semester of 1869. This request prompted a fundamental decision by the university senate to allow women to attend lectures under certain conditions, taking into account personal circumstances. They were permitted, provided the lecturer had no objections. By the end of the nineteenth century, the number of female students at universities in Baden, as elsewhere in the German Empire, had increased considerably. Most women attended to further their education without taking any formal examinations, although some were awarded doctorates.

Despite this progress, women were still excluded from systematic study. Unlike their male counterparts, a woman's permission to attend lectures could be revoked at any time, and ordinary matriculation was not an option, since women were barred from meeting the requirements for university admission in Germany.

Activists in the women's movement recognized that further progress toward gender equality could only be achieved through equal educational opportunities. Consequently, education became a central focus of the bourgeois women's movement. Following models established in Prague and Vienna, the Women's Educational Reform Association *Frauenbildungsreform* opened a girls' preparatory school, called a *Gymnasium*, in Karlsruhe in February 1893. After six years, the first four girls graduated in 1899. This grammar school probably provided the best preparation of girls for the Abitur, leading to the establishment of similar schools across the German Empire based on the Karlsruhe model.

In the summer semester of 1900, Baden became the first state in the empire to allow women to enroll at its state universities. A little later the other states in the empire also made it possible for the growing numbers

of female high school graduates to enroll at their universities. Bavaria initially followed Baden's example in the winter semester of 1903/04, followed by Württemberg in the summer of 1904. By 1909, the enrollment of women had been introduced in all the states and universities of the German empire. /146

Marco Birn

029 Certificate of Honorary Membership for Gas Chemist Hans Bunte (1910)

This exquisitely crafted certificate is one of the numerous honors awarded to Hans Bunte (1848–1925), a distinguished chemist who served as professor of technical chemistry at Karlsruhe Polytechnic starting in 1887. Bunte made significant contributions to fuel chemistry and combustion technology, laying important foundations for the heating industry. His research focused primarily on the production of gas from coal. Known as illuminating gas or town gas, this energy source, which comprises approximately 50 % hydrogen and 20 % methane, was widely used for lighting and heating until it was gradually replaced by natural gas in the 1960s.

Hans Bunte, who also served as secretary general of the German Association of Gas and Water Experts (DVGW) since 1884, played a pivotal role in organizing Germany's gas and water supply infrastructure. His influence, together with the petroleum research of his colleague Carl Engler (1842–1925), established KIT's longstanding focus on energy, which continues today. The former Gas Institute at the Polytechnic is now part of the Engler-Bunte Institute at KIT.

The colored ink drawing above the text of the certificate depicts the Gas Institute, which was founded at Karlsruhe Polytechnic at Bunte's initiative. In 1907 this institute served as the central teaching and research center for the DVGW, in association with the Polytechnic. The chemical processes involved in gas production were its primary research focus, and it also provided annual training courses for gas works management personnel throughout Germany. *kn*

Certificate of honorary membership in the Bavarian Association of Gas and Water Experts for Hans Bunte,
October 23, 1910,
maker: Franz Xaver Weinzierl, Munich,
38.8 × 30.0 × 2.0 cm,
autograph document on parchment with an ink miniature,
in an ornamental leather binding with brass appliqués.
KIT Archives 27055/67.

↘ Research; Teaching and Academic Study; Innovation

↩ 011; 036; 038

Hans Bunte's Research and Development in Technology

In a history of the Gas Institute, written on the occasion of Hans Bunte's fiftieth anniversary, Johannes Körting characterizes him as having "to seek his life's work in a dichotomy: either research and teaching activities, or rather the constructive technical-design side." /147 Hans Bunte's honorary membership in the Bavarian Association of Gas and Water Experts reflects one side of this dichotomy: the desire to promote the utilization of scientific knowledge in technical industrial practice and everyday life through his professional activities.

The other side of his disposition was awakened by Hermann von Fehling, known for Fehling's solutions for quantitative detection of aldehyde groups in sugars, whom Hans Bunte met during his studies at the Stuttgart Polytechnic between 1865 and 1867. After a brief period at Heidelberg University in 1868 with its great research personalities Bunsen, Kirchhoff, Helmholtz, and Erlenmeyer, Bunte completed his studies in Erlangen in 1869 with a doctoral thesis under the organic chemist von Gorup-Besánez on his self-chosen topic: "Investigations on Urea and Urea Derivatives." One motivation for these investigations can be inferred from Bunte's speech on the occasion of the handover of the rectorship at Karlsruhe Polytechnic on October 31, 1896. Bunte outlined numerous examples of how discoveries in chemistry could solve people's everyday problems and increase their prosperity. For example, he categorized Wöhler's synthesis of urea as the removal of the barrier "which seemed to have been erected between organic and inorganic nature; the belief that a special force, the live force, was active in the chemical processes in the animal and plant kingdoms to create new forms, had fallen and the door was opened for chemical research to enter the field of plant and animal physiology, agriculture, and medicine." /148

Bunte's work on topics from organic chemistry, which he carried out at Munich Polytechnical College with his academic teacher from his time in Heidelberg, Emil Erlenmeyer, in a "meanly paid assistant position," was presumably based on the same motivation. /149 There he discovered the salts of the S-alkyl esters of thiosulphuric acid. This class of compounds, of which he described the sodium salt of the S-ethyl ester in his habilitation thesis in 1872, has entered the literature under the name "Bunte salts." They are useful intermediates in chemical syntheses and exhibit bacteriostatic, insecticidal, and fungicidal effectiveness. As a private lecturer, Bunte gave lectures on tar dyes and, in particular on analytical chemistry, which undoubtedly also shaped his scientific approach and methodology. Despite his suc-

cesses with synthesis and versatility in teaching, the prospects boding at the beginning of his career did not materialize, and more tangible forms of recognition also failed to happen.

This may be interpreted as impetus for Bunte to rediscover the technical side of his disposition. The setting for this was provided by his acquaintance with Nikolaus Heinrich Schilling, who was director of the Munich Gas Lighting Company and editor of the technical journal for the gas and lighting utilities and water supply, *Journal für Gasbeleuchtung und verwandte Beleuchtungsarten, sowie für Wasserversorgung*. He recruited Bunte for this periodical in 1874. The journal was also the organ of the German Association of Gas and Water Experts and its Branch Associations, which Bunte joined in 1875. In close cooperation with Schilling and later as head of the heating test station of the Munich Gas Lighting Company, Bunte carried out numerous experimental studies that formed the scientific basis for the production of gas from coal and its technical application. Hans Bunte introduced the new scientific principles of heating technology and findings by the gas industry into German university teaching for the first time with his lectures on fuels, gas analysis, and combustion at the Munich Polytechnic. Due to the lack of recognition for his work, Bunte left that polytechnic in 1884 without much regret to work full-time for the gas industry. To this end, he had already taken over the editorship of the *Journal für Gasbeleuchtung* (since 1876, together with Schilling, and from 1883 alone), was chairman of the *Deutscher Verein der Gas- und Wasserfachmänner* (German Association of Gas and Water Experts) in 1882–1883 and its secretary general from 1885. He held this post until 1909 and was thus a key driving force behind the intensive scientific and technical development of the German gas industry.

Carl Engler, who had begun intensive research into the chemistry of crude oil in Karlsruhe, brought about Bunte's appointment as his successor to the Chair of Chemical Technology at Karlsruhe Polytechnic. The professional connection to Engler had been established through work on the subject of lubricating oils. The rapidly growing opportunities in Karlsruhe nurtured Bunte's development as an academic teacher and organizer. He introduced new aspects to teaching, emphasizing the economic side of chemical engineering. For the first time, chemistry students gained insight into the economic context and he pushed for training in mechanical engineering subjects to make their collaboration with specialists from outside the field more effective. Together with Engler, he fought for the right of Polytechnics to award doctorates.

The expansion of the institute was also linked to Bunte's cultivation of special fields of technical chemistry, by which the research and teaching there was diversified. At times, up to seven private lecturers worked for Bunte. The field of tar dyes, on which he himself had l ectured in Munich, was transferred to these young coworkers and eventually evolved into textile chemistry. Areas of applied physical chemistry and especially electrochemistry were entrusted to Bunte's young colleagues, in particular, Fritz Haber. But he was not an easy teacher for his young and aspiring colleagues. His former assistant Ernst Terres remembers: "a word of praise was rarely or never spoken after a completed piece of work. The wordless recognition of what had been achieved was already recognition and praise enough." ↗150 Despite everything, Fritz Haber characterized his time with Bunte positively: "The 13 years with Bunte were the hardest of my life, but this time of growth, hope, and advancement were the happiest years of my professional career." ↗151

The conditions at Karlsruhe meant that research work had to be transferred from industrial applications to the laboratory. As technology progressed, problems of gas purification and gas utilization came to the fore and required ever new scientific methods. As the research topics grew, so did the requirements. The institute responded to this with multiple extensions and expansions. The result was an institute many times the size of what Bunte had found when he was initially appointed.

Despite the remarkable pace of development, Bunte felt that laboratory work alone was often insufficient for studying technical processes. From his time in Munich, he had also learned that conducting scientific investigations within a company focused on economic efficiency during normal operations was limited. His solution was, to establish a dedicated scientific testing facility. After years of preparation, during which he secured most of the necessary funding himself, Bunte founded the Teaching and Testing Station of the German Association of Gas and Water Experts in 1907. The institute, affiliated with Karlsruhe Polytechnic and later known simply as the "Gas Institute," provided the illuminating gas industry with a unique research facility unmatched by any other sector.

The many other facets of Hans Bunte's personality — as Privy Councilor (Geheimer Hofrat), member of the First Chamber of the Baden Diet and of the German Academy of Sciences Leopoldina, and founder of the "gas courses" — can only be briefly noted here. Körting best captured his legacy: "That with this [dual] disposition, he ultimately became one of the pioneering figures who achieved a perhaps unprecedented synthesis of both areas to perfection, perhaps becoming the first chemical engineer in the modern sense, was fortunate for him and even more so for the entire gas industry." ↗152

Henning Bockhorn

030 Professorial Robe at Karlsruhe Polytechnic (ca. 1961)

In 1913, the Baden State Ministry granted professors at Karlsruhe Polytechnic the right to wear a robe and bonnet on ceremonial occasions. This official attire, intended to convey imposing dignity, was inspired by medieval university practices. The Karlsruhe professorial robe, like the one shown here, was made of black cloth with green lapels, reflecting the Polytechnic's colors. This regalia was the crowning achievement of a series of individually acquired symbols of university status. Following the bestowal of the right to confer doctorates in 1899, the rector was granted the right to be addressed as "Magnifizenz" (Latin: *magnificentia*) and soon afterwards came a large seal, a rectorial chain of office, and the honorable naming of Karlsruhe Polytechnic after the Grand Duke of Baden.

The robes were initially worn for the annual handover of the rectorate and later for the annual academic festivities unrelated to rectorial changeovers. Professors wore their robes during the ceremonial event celebrating the Polytechnic's centennial in 1925, held in the Courtyard of Honor. This tradition continued for the next celebratory occasion in 1950 as well. However, after 1968, at Karlsruhe University academic robes were no longer worn on ceremonial occasions. In 1974, Rector Heinz Draheim declared that "such outward displays should not unsettle the positive atmosphere at the university." ↗153 *kn*

Robe of Professor of Chemistry
Ernst Ulrich Franck (1920–2004),
ca. 128 × 78 cm,
woolen fabric.
KIT Archives 28507/2.

↘ Everyday Life and Culture

↩ 025; 026; 027
↪ 074

031 Beer Stein (1913)

"My first impressions of a German polytechnic were quite peculiar. While Russian students ↗154 were actively engaged in political debates, discussing complex issues late into the night without arriving at practical solutions, I unexpectedly encountered German corps students with scarred faces, comportment I could not understand, and a pronounced thirst for beer. It was a completely alien world, characterized by a strange concept of 'honor' and a notable dose of arrogance." ↗155

This was the impression that Karlsruhe Mechanical Engineering Professor Rudolf Plank (1886–1973) had of organized student life when he moved from St. Petersburg to Dresden in 1905. Given the rich tradition of student fraternities and drinking culture in Karlsruhe, it is unlikely that Plank would have had a different experience had he arrived in Karlsruhe as a student. One of the visible elements of life in various student fraternities is the formalized consumption of beer. This tradition includes beer steins adorned with the coat of arms, motto, watchword, and monogram-like "Zirkel" of the respective fraternity. The specimen shown here comes from the 'Gewerbewissenschaftlicher Verband Vitruvia' in Karlsruhe, about which little is known. The forms visible here indicate that proximity to student fraternities was at least sought. As the fraternities of that time brought together a social elite, their customs were also imitated by other groups. *kn*

Lidded beer stein with a dedication
by Karl Schächtele to Ernst Seeger.
13.5 × 9.0 × 12.5 cm,
glass, tin, enamel paint.
KIT Archives 28510/1.

↘ Everyday Life and Culture

↩ 013

First World War and Interwar Period (1914–1933)

032 Calculation Table for Anti-Aircraft Fire (1915)

The panel, consisting of tables and a shiftable reading pointer, was designed as a tool for defense against enemy aircraft during World War I. When the war began, airplanes were quickly developed into a weapon. The city of Karlsruhe was one of the early targets of bombing raids. The first was on June 15, 1915, killing 30 people. Another attack in 1916 killed 120 people, including 71 children. Since 1914, Josef Bürgin (1872–1917), a surveyor at Karlsruhe Polytechnic, had been working on calculation aids for defensive fire. Not only the impact of the war on the civilian population but also the presence of anti-aircraft positions in Karlsruhe may have been a driving force behind his decision to apply his expertise in this way.

The problem tackled by Bürgin involves the rapid motion of aircraft in three-dimensional space and their distance away. A flying object traveling at 150 kilometers per hour at a distance of 1,000 meters can cover around 50 meters distance in the time it takes for a projectile to travel from the gun to it. Therefore, anti-aircraft guns are aimed at the point where the projectile and the target will meet. The difference between this and the gun alignment directly on the target is called the lead. Calculating the lead requires an equation that relates distance, direction, and the velocities of both target and bullet. The calculation tables created by Bürgin are an attempt to reduce the time required for this enough to be able to use the result in practice. The lack of signs of wear on the tables created by Bürgin suggests, however, that his tools must have served as models at best. *kn*

Calculation table (“Table I”)
for anti-aircraft fire,
maker: Joseph Bürgin,
61.9 × 41.2 × 3.4 cm,
wood, paper, celluloid, metal.
KIT Archives 28508/60

↘ Research; Innovation

↩ 045; 049; 050

067 Hydrogen Automobile 1986

→ p.281
↩ 008; 029; 066
↪ 072



067 Hydrogen Automobile 1986

→ p.281
↩ 008; 029; 066
↳ 072

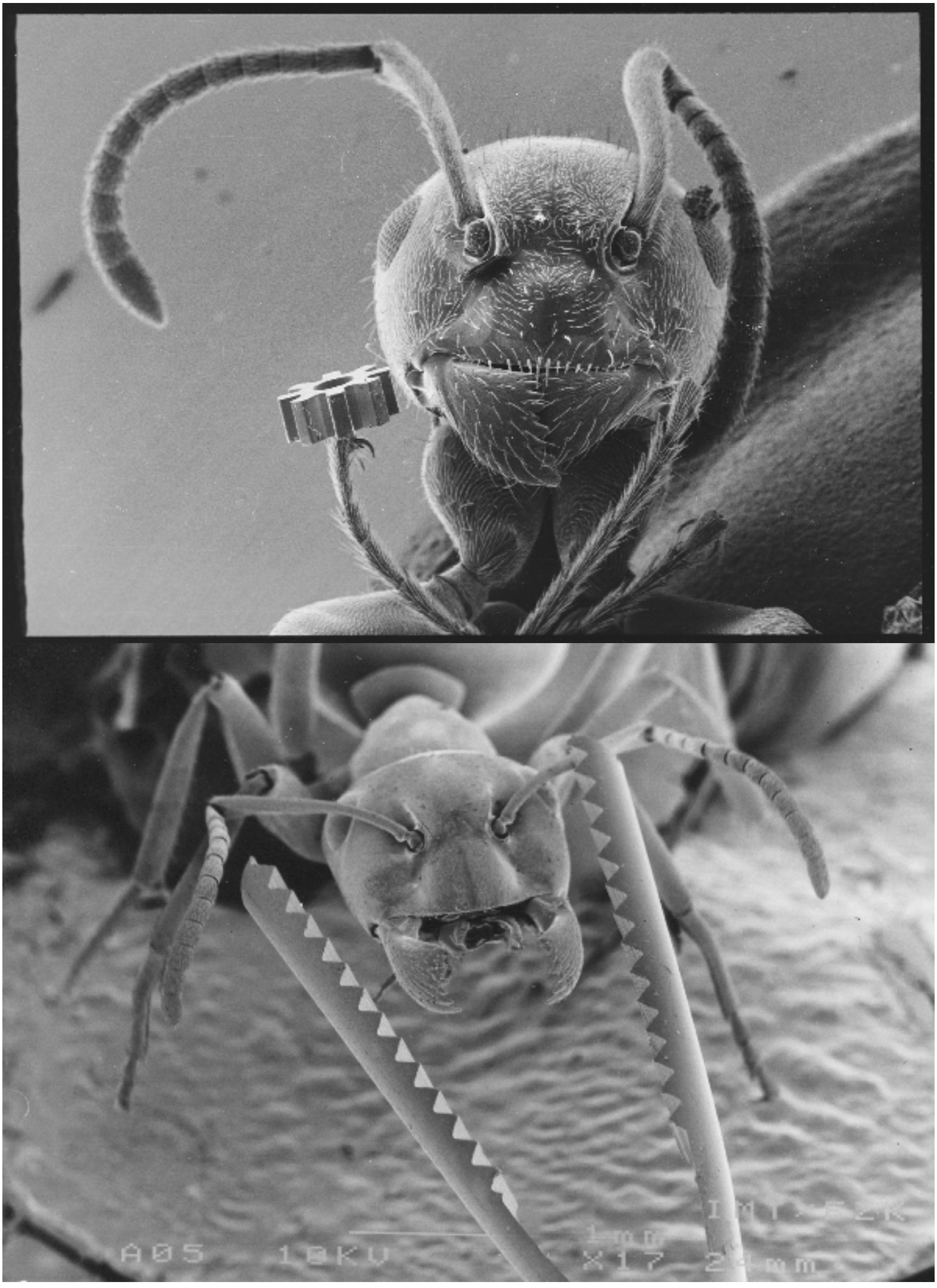



TUCHER
KLEENEX

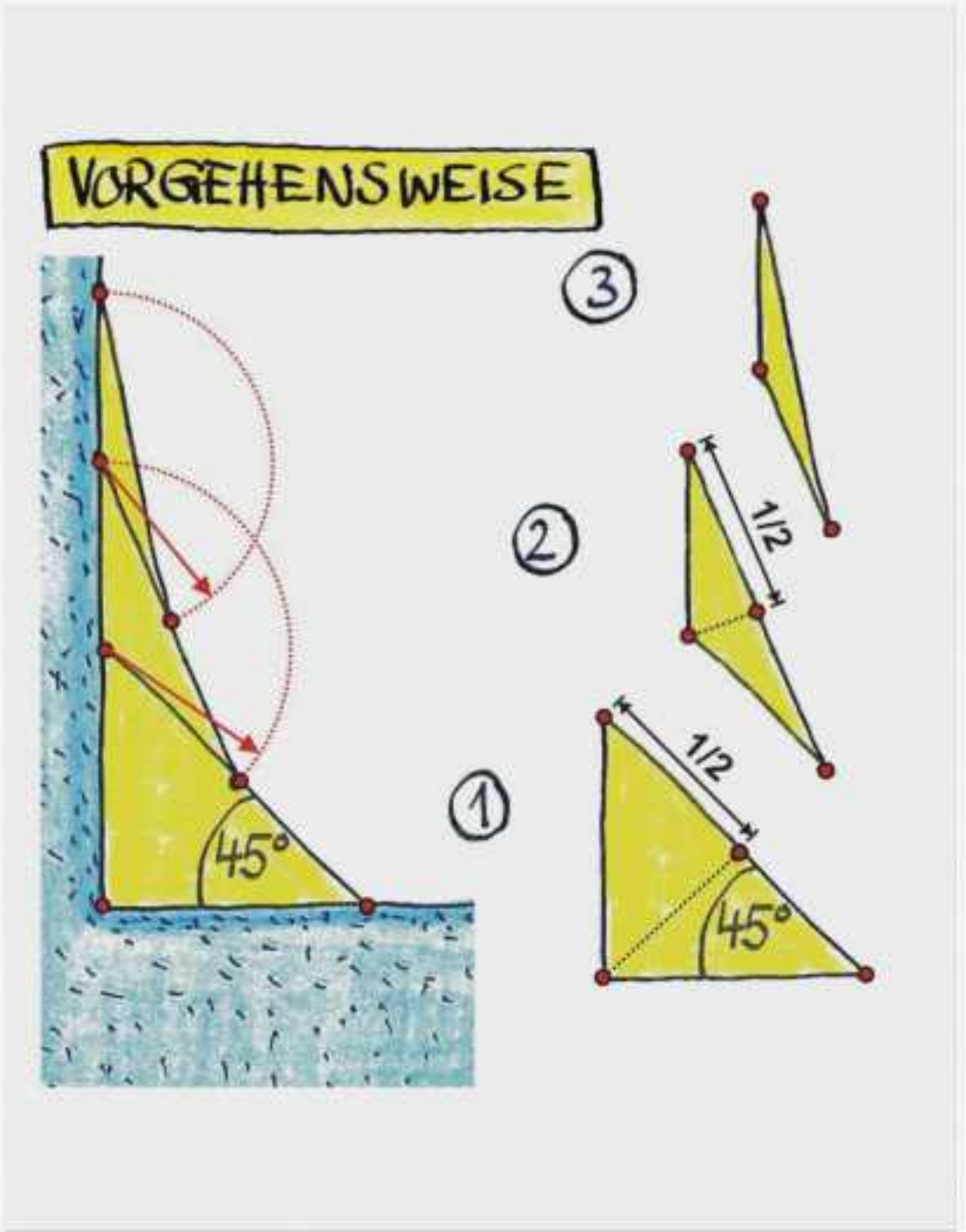

THE NUCLIDES
KLEENEX
100

069 “Henry the Ant” with His Gearwheel 1986

→ p.283
↩ 063



The Tension Triangle as a Bionic Stabilization Principle 2005



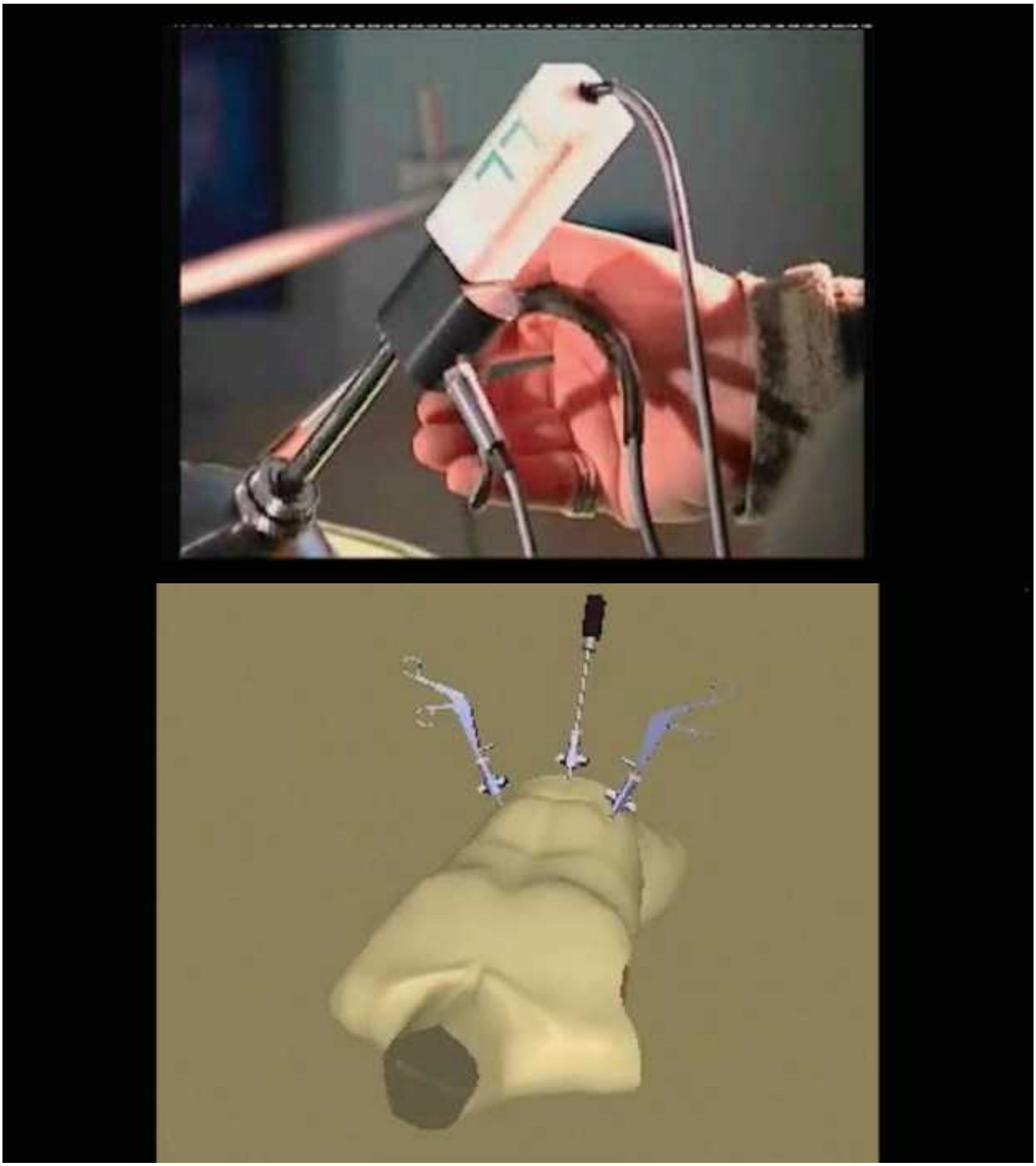
→ p.284



071 Trainer for
Minimally Invasive Surgery ca. 2003



→ p.284



072 Superconducting Magnetic Coil for Nuclear Fusion 2000

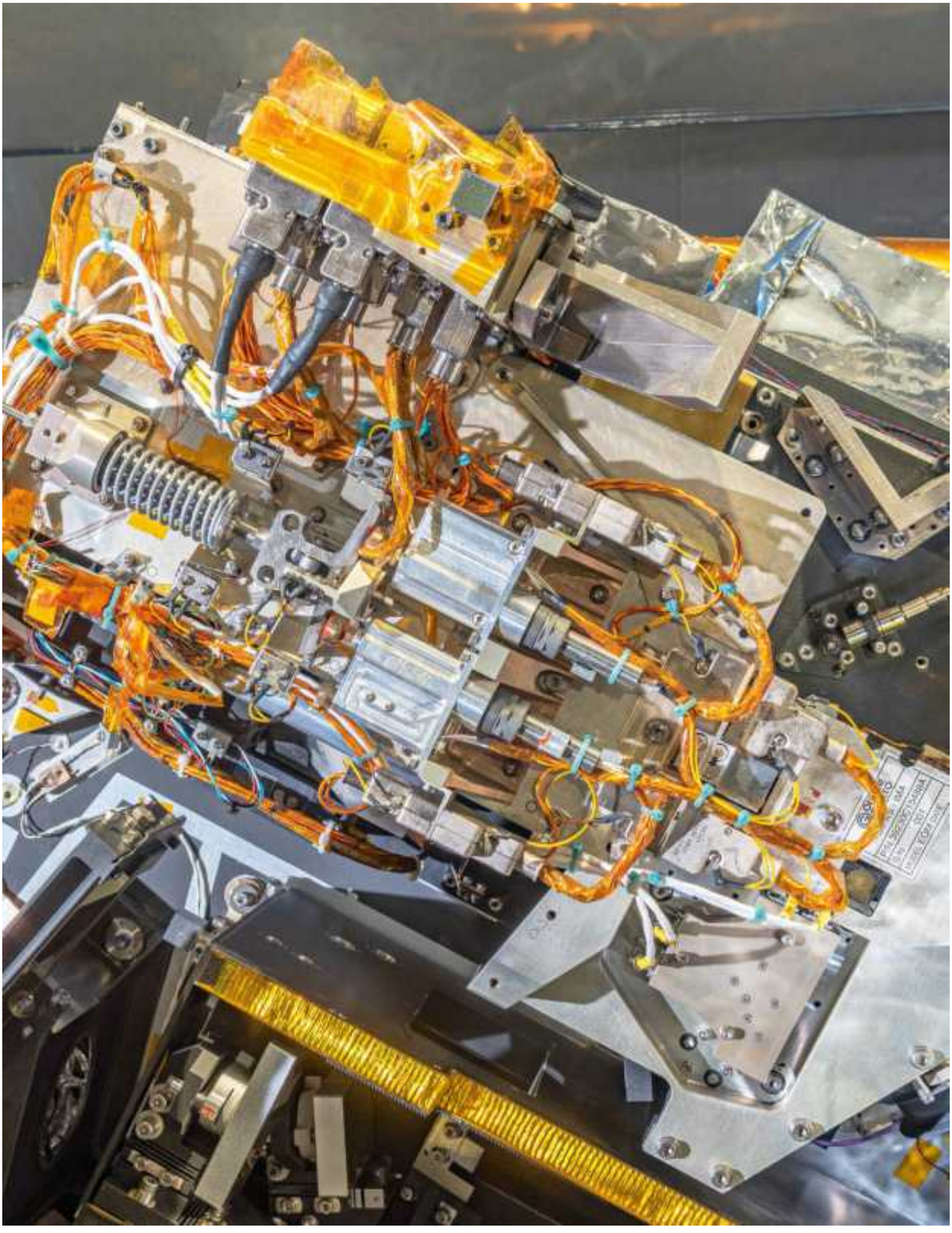


→ p.285
↩ 008; 029;
036; 067



073 MIPAS Spectrometer 2002

→ p.286
↩ 007



→ p.287
↩ 015; 030


Dies ist nicht die längste Schlange...
...kommen Sie mal zum Programmieren...
wir brauchen ein
Rechenanl
POL
KA-


UNIVAC 1108

075 Self-Launching Glider 1971

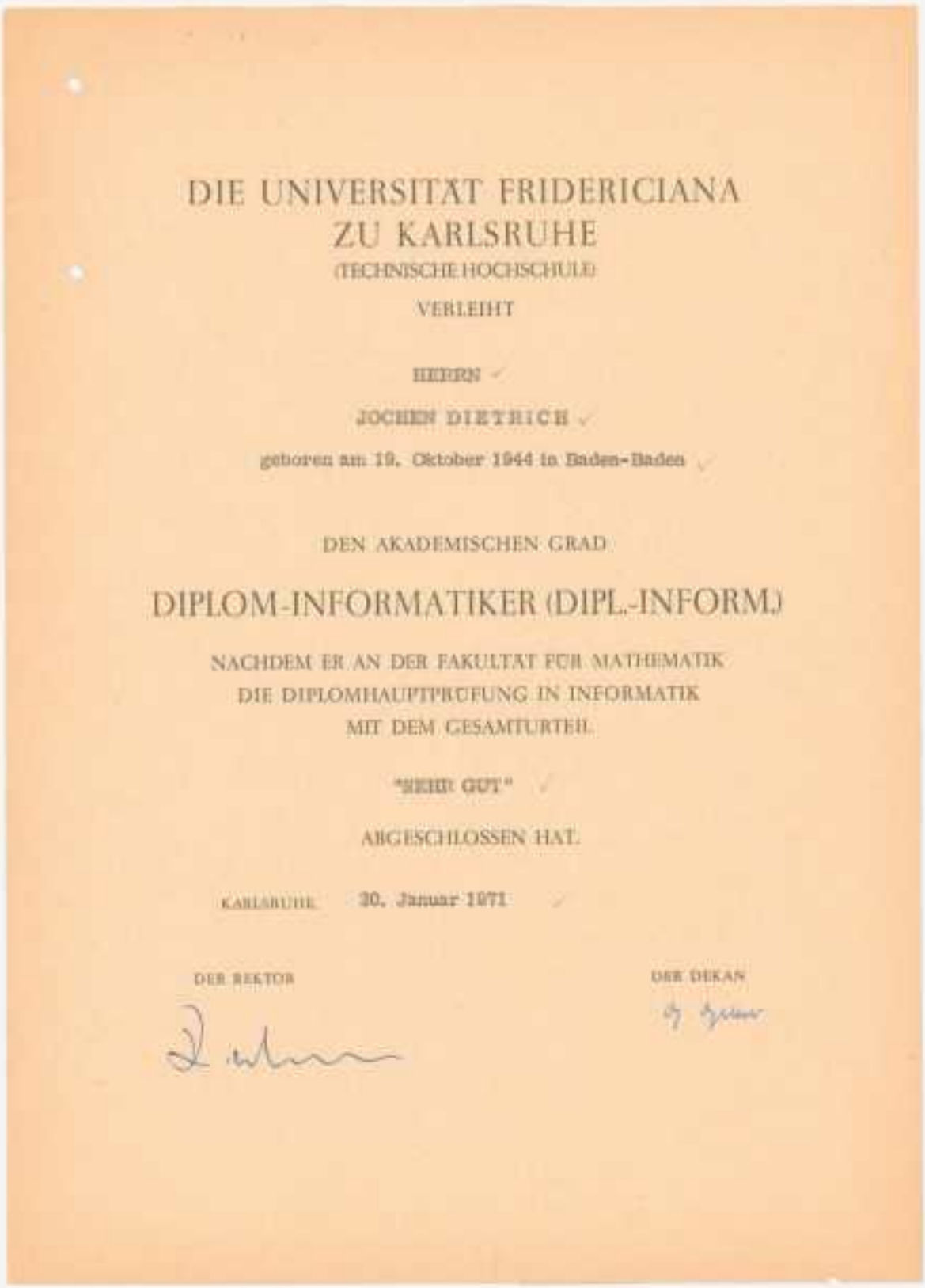


→ p.288
↩ 040



First German Computer Science Diploma 1971

→ p.305
↩ 057
↪ 087



DIE UNIVERSITÄT FRIDERICIANA
ZU KARLSRUHE
(TECHNISCHE HOCHSCHULE)
VERLEIHT

HERRN

JOCHEN DIETRICH

geboren am 19. Oktober 1944 in Baden-Baden

DEN AKADEMISCHEN GRAD

DIPLOM-INFORMATIKER (DIPL.-INFORM.)

NACHDEM ER AN DER FAKULTÄT FÜR MATHEMATIK
DIE DIPLOMHAUPTPRÜFUNG IN INFORMATIK
MIT DEM GESAMTURTEIL

"SEHR GUT"

ABGESCHLOSSEN HAT.

KARLSRUHE 30. Januar 1971

DER REKTOR

DER DEKAN

033 Fritz Haber as a Gas Warrior (from 1915 on)

There is an expressive charcoal drawing in the KIT Archives created by Ernst Schlumberger (1887–1943). It depicts Fritz Haber (1868–1934) in uniform, assisted by a winged monster, spraying poison gas on a battlefield. Schlumberger had studied under Haber at Karlsruhe Polytechnic and then become an assistant at the Institute of Physical Chemistry and Electrochemistry under Haber's successor, Georg Bredig, who also supervised his doctorate. In 1911, Haber was appointed as the founding director of the Kaiser Wilhelm Institute of Physical Chemistry and Electrochemistry in Dahlem, near Berlin. In this role, he collaborated with the German General Staff in 1914 to develop chemical warfare agents. He allocated his institute's resources to this effort and personally oversaw the deployment of poison gas on the battlefield. The German gas attack near Ypres, Belgium, in April 1915, which involved the release of 150 tons of poison gas, marked the first use of chemical weapons as tools of mass destruction.

Schlumberger's undated drawing was probably made after the poison gas attack near Ypres. Created by a colleague at Haber's former Karlsruhe Institute, this work is a critical commentary from within his own field of expertise.

Ernst Schlumberger, his Jewish wife Käthe, and their daughter Beate committed suicide in 1943, when Käthe Schlumberger's deportation to an extermination camp was impending. In Berlin-Lichterfelde, engraved memorial stones, so-called "Stolpersteine" — stumbling blocks — created by the artist Gunter Demnig, remind passers-by of that family's fate. *as*

Ernst Schlumberger:
Fritz Haber as a Gas Warrior,
34.0 × 30.5 cm,
charcoal drawing.
KIT Archives 28015/2.

↘ Everyday Life and Culture

↩ 036
↪ 095; 096

034 Doctoral Certificate of Irene Rosenberg (1915)

Irene Rosenberg (1890–1986) was a German chemist. After graduating from Lessingschule in Karlsruhe in 1909, she studied chemistry at Karlsruhe Polytechnic and Breslau University (today in Wrocław, Poland). Following her *Diplom* examination at Breslau, she returned to Karlsruhe and began to write her thesis in chemistry under Carl Engler. Her dissertation, *On Some Components of Sweet Chestnut Leaves*, dated November 27, 1915, made Irene Rosenberg the first female student at Karlsruhe Polytechnic to be awarded a doctorate in engineering (*Dr.-Ing.*). At that time, the female form of this academic title in common use in Germany today, did not yet exist.

Before the National Socialist takeover, Irene Rosenberg had been an active member of the German Association of Women Academics. Due to her Jewish background, she was compelled to withdraw. After marrying the medical doctor Eric David Adler, she worked as a technical medical assistant. Dr. Adler mentions her collaboration in one of his essays from 1921. ↗ 156

In 1938, Irene Rosenberg fled to the United States with her husband and youngest daughter to escape Nazi persecution, and their two elder children joined them in 1939.

Irene Rosenberg, the first female doctoral graduate of Karlsruhe Polytechnic, has been acknowledged otherwise as well. In 1994, a street connecting Engelbert-Arnold-Straße and Engesserstraße on KIT's South Campus was named in her honor. The Irene Rosenberg Program has been offered since 2002 in Baden-Württemberg for the promotion of doctoral studies by women in the engineering sciences. The prize sponsored by *Robert Bosch GmbH* for the best master's thesis by a female graduate in mechanical engineering is also named after her. *as*

Doctor of Engineering diploma issued by
Karlsruhe Polytechnic,
November 27, 1915.
KIT Archives 21013/248.

↘ Research; Teaching and Academic Study; Milestones in KIT's History

↩ 028; 050; 053

035 Emergency Money Vouchers for On-campus Living (1923)

This emergency money voucher, printed in October 1923 by the Karlsruhe Association of Student Services, exemplifies a level of support for academic living that far surpasses current day-to-day needs. During the hyperinflation of that year, the German Empire's currency, the reichsmark, lost so much value that it became practically unusable. For instance, a 280-million-reichsmark subsidy intended for building academic sports facilities depreciated so drastically during the transfer transaction of the money, that by the time it reached the Polytechnic's account, it could only cover the cost of a few sheets of drawing paper. /157 The cash desks of Karlsruhe Student Services were a focal point for most transactions on campus. In 1921, it had opened a refectory in the architecture building's basement, becoming a hub of daily student life. This association, established in 1919, took on student welfare responsibilities at the Polytechnic four years later as part of Student Affairs (*Studentenwerk*). The issuance of emergency exchange vouchers was an attempt to create an independent functioning payment system. Such a facility on campus thus offered a service similar to ones set up by many municipal authorities during this turbulent period. *kn*

Emergency money voucher of the
Karlsruhe Association of Student Services,
October 10, 1923.
7.0 × 5.4 cm.
KIT Archives 28009/35.

↘ Everyday Life and Culture

↩ 040

036 Ammonia Synthesis Reactor (1923)

The rusty column now standing on KIT's South Campus served since 1923 as a reactor for ammonia (NH_3) production at *Badische Anilin- und Soda-Fabrik* (BASF) in Oppau near Ludwigshafen am Rhein. After its decommissioning, the large-scale device was relocated to the campus as a technical monument. It is a reminder of the development of ammonia synthesis until 1908 by Fritz Haber, professor of physical chemistry at Karlsruhe Polytechnic, with his team of collaborating BASF employees. Carl Bosch of BASF then played an important role in scaling the process for industrial use.

The synthesis of ammonia from hydrogen and atmospheric nitrogen addressed the late nineteenth-century challenge of utilizing the nitrogen in air, which was abundant but hitherto inaccessible. The driving force at the time was the anticipated depletion of natural fertilizers, upon which the food supply of the industrialized nations depended. By solving this supply issue through ammonia synthesis, a versatile primary product became available for the chemical industry. Ammonia is also used as an environmentally friendly refrigerant and in the production of explosives, and its potential as an energy carrier is being increasingly discussed today.

Ammonia synthesis not only earned Fritz Haber the Nobel prize in chemistry but also advanced his career. He was appointed director of the Kaiser Wilhelm Institute of Physical Chemistry and Electrochemistry, founded near Berlin in 1911. During World War I, he worked there on developing poison gas and personally led the first frontline use of this new chemical weapon. This aspect of his work has been the subject of much criticism, as reflected in acts of protest affecting the ammonia reactor and the street sign on Fritz-Haber-Weg, which runs past it. *kn*

Ammonia synthesis reactor applying the
Haber-Bosch process,
maker: BASF, Ludwigshafen,
height: 13.35 m,
steel and other metals.
KIT South Campus, crossroads between
Fritz-Haber-Weg and Engesserstraße.

↘ Research; Innovation;
Call for Objects

↩ 011; 029; 033; 038
↪ 095; 096

Object proposal
The development of the Haber-Bosch process for the synthetic production of ammonia from nitrogen and hydrogen caused a world sensation and had a revolutionary impact on global history. Ammonia allowed industrial-scale production of artificial fertilizer and explosives in gigantic quantities at very low cost, disregarding natural saltpeter availability. Prof. Fritz Haber and Dr. Carl Bosch were both awarded the Nobel prize in chemistry.

Dipl.-Ing. Eckhard Dietrich,
General Mechanical Engineering, graduated
1965, and alumnus

037 Voltmeter (ca. 1910)

The voltmeter is one of the most common measuring devices in electrical engineering. The one shown here is used to measure low voltages accurately, up to 10 volts. Manufactured around 1910 by the Dr. Th. Horn factory in Leipzig. It was handed over to KIT Archives by the Institute of Regulation and Control Systems. Its analog display mechanism and heavy brass housing indicate the early expansionary phase of electrical engineering at Karlsruhe Polytechnic. Electrical engineering had been represented at Karlsruhe since 1885, initially by private lecturer August Schleiermacher (1857–1953). He provided lectures for students of various disciplines, primarily mechanical engineering. His own subject saw significant growth following Engelbert Arnold's (1858–1911) appointment as full professor in 1894 — Schleiermacher's promotion to this rank was in 1896. In 1895, the Department of Electrical Engineering was established, which later evolved into KIT's Department of Electrical Engineering and Information Technology. Electrical engineering thus advanced from a supporting role to a position on a par with architecture, civil engineering, chemistry, and mechanical engineering. This growth was met by the construction of the prestigious Electrotechnical Institute, completed in 1899. The establishment of the Light Technology Institute in 1922 demonstrated the role of electrical engineering as a driving force in the institutional development of Karlsruhe Polytechnic during a challenging period. This expansion was significantly supported by strong ties with industry, which funded specific research activities. *kn*

Voltmeter with measuring range up to
10 volts,
maker: Dr. Th. Horn/Leipzig,
25.0 × 12.0 × 12.0 cm,
metals, glass, etc.
KIT Archives 28509/102.

↘ Research; Teaching and Academic Study

↩ 041

038 Fractionating Column (1930)

This model representation of a fractionating column exemplifies chemical engineering at KIT. Fractionation is the separation of liquid mixtures by applying heat in fixed, consecutive steps. This process involves repeated cycles of distillation as the basic operation, enabling chemical production on an industrial scale. The separation of crude oil into its component parts in refineries is one of many applications of fractionation.

At Karlsruhe Polytechnic, the research conducted by Emil Kirschbaum (1900–1970) on the fractionation process from the late 1920s onward laid the foundation for the development of chemical engineering as a distinct discipline. The Institute of Chemical Engineering, established in 1872, was already dedicated to applying chemical processes on an industrial scale, for a long time focusing mainly on the production of town gas and petroleum chemistry.

Kirschbaum transitioned to chemical engineering from the thermodynamics practiced in mechanical engineering. In 1929, he founded the Institute of Apparatus Engineering at the Polytechnic, which operated test facilities for researching the fractionation process. This work initially led to the formation of a process engineering branch within the Department of Mechanical Engineering. In 1969, the Karlsruhe Department of Chemical Engineering was established, also incorporating chairs in chemistry related to gas, oil, and water technology. *kn*

Model of a fractionating column,
ca. 85 × 33 × 88 cm,
copper, brass and other metals.
KIT, Institute of Thermal Process Engineering.

↘ Research; Teaching and Academic Study; Innovation; Milestones in KIT's History

↩ 011; 029; 036

On the Role of Chemical Engineering

Products derived from process engineering are all around us. They range from seemingly simple items like drinking water, sugar, salt, petrol, or basic chemicals, to more complex products such as construction materials, dyes, plastics, foodstuffs, active pharmaceutical ingredients, and battery materials. Process engineering is also crucial for managing waste streams, such as exhaust and wastewater, or recycling materials within a circular economy.

The KIT Department of Chemical Engineering addresses a broad spectrum of process engineering topics in both teaching and research. Fractionation, a particularly energy-intensive operation, is just one of many fundamental processes employed in this field. Process engineering involves the targeted and optimized combi-

nation of various fundamental operations. In teaching, these operations are explored theoretically, quantified using mathematical models, and demonstrated practically. Alongside learning how processes work, students also develop knowledge about products and materials. They receive a practice-oriented engineering education that touches on the natural sciences, including physics, chemistry, and biology. In research, basic operations, equipment, and processes are used to develop novel applications by means of modern experimental, numerical, and analytical methods.

Current societal challenges where process engineering can make a significant impact include the transformation of the economy toward greater efficiency, sustainability, and climate protection. Research in this area, for instance, focuses on addressing various unresolved aspects of a future hydrogen economy based on renewable energy sources.

Matthias Kind

039 Table Knife from the Refectory (ca. 1930)

A table knife with a silver-plated handle and a stainless-steel blade shows clear signs of wear. The notably greater length of this piece of cutlery, only familiar to us these days in a flea market, indicates its origin from a bygone era. The silver plating signifies the association of this object with an upscale milieu. It bears the stamp "Karlsruher Studentenhaus," identifying it as part of the inventory of the refectory established in 1930 for students at Karlsruhe Polytechnic. The knife's design reflects the elite status of students at a time when only a small percentage of the German population went to college — unlike today, with approximately 55 percent pursuing higher education. ↗ 158 A century ago, the Polytechnic had around 1,200 students, a stark contrast to the approximately 22,000 at KIT today.

Students at Karlsruhe Polytechnic could benefit from the infrastructure of a student residence fully equipped to meet their needs. This facility included a refectory with a terrace café and refreshment counter, living quarters, a reading room, a study, a games room, and even a ballroom with a stage.

The knife's journey to KIT Archives underscores the appreciation of the amenities provided by the *Studentenhaus*. An alumnus, who had kept the knife since his student days, returned it at 91 years of age. It is unlikely that absconded cafeteria cutlery from the postwar period will be cherished so much in the future. *kn*

Table knife from the Karlsruhe Studentenhaus,
maker: Gebrüder Hepp/Pforzheim,
25.2 × 2.3 × 1,2 cm,
metals.
KIT Archives 28506/1.

↘ Everyday Life and Culture

↩ 065

040 Grandstand of the Sports Stadium (1927–1931)

Today, university sports at KIT encompass recreational and competitive activities offered to students and staff through the Institute of Sports and Sports Science. The scientific role of this institute in research and teaching has a long prehistory. As early as 1833, a gymnastics club was established by students at Karlsruhe Polytechnical College.

Before World War I, geology professor Wilhelm Paulcke (1873–1949), an avid mountain sports enthusiast, began advocating physical exercise at Karlsruhe Polytechnic. His efforts only gained significant traction after World War I. With the ban on compulsory military service imposed by the Treaty of Versailles and widespread discontent with the peace terms, conditions became favorable for promoting physical exercise. Students began calling for mandatory physical education as part of their university curriculum, partly to compensate for the training previously conducted in the military. This led to the integration of sports into university life across Germany. There were also specific military elements to it, such as shooting training.

By 1931, Karlsruhe Polytechnic had constructed large sports facilities, including a grandstand on Engesserstraße that is still standing today. Designed by Karlsruhe architecture professor Hermann Alker (1885–1967), the grandstand features a self-supporting concrete roof which was a remarkable architectural innovation. With approximately 1,000 seats, it could accommodate most of the student body at Karlsruhe at the time. Film footage of the annual sports festivals shows enthusiastic active and passive participation, with professors seated in the front rows. Winners of the competitions were awarded their prizes with a handshake from the rector. *kn*

Grandstand construction for the stadium at
Karlsruhe Polytechnic,
design: Hermann Alker,
built between 1927–1931.
KIT South Campus, Engesserstraße 20.

↘ Teaching and Academic Study;
Everyday Life and Culture

↩ 035; 042; 051; 075

On the Design of the Academic Sports Stadium in Karlsruhe

From the perspective of academic sports, the university stadium is a testament to the innovative vision of Rector Wilhelm Paulcke, a key figure in the German Academic Committee for Physical Exercise and founder of several national ski associations. Since 1914, Paulcke had been championing the "minimum requirement of a training ground and a sports instructor" at Karlsruhe Polytechnic, despite resistance from his own department. In his opinion, his colleagues in the Senate initially had "little understanding" for his cause. ⁄159 Paulcke was deeply troubled by what he perceived as the students' deteriorating health and he was equally concerned about enhancing psycho-social development through physical exercise. ⁄160 When Paulcke became rector of the Polytechnic in the academic year 1919/20, his position gained substantial leverage. Germany's defeat and the abolition of compulsory military service under the Treaty of Versailles fostered widespread support for university sports, which now suited as an important substitute for military training. The Karlsruhe stadium was built to the latest standards: the grandstand suitably housed facilities for the planned health and physical education institutes besides a large exercise and gymnastics hall still in use today. The plans also included administrative and teaching rooms, well-equipped washrooms, a fatigue pool, and a room for sports medicine treatments. The outdoor facilities, set amidst the greenery of the pheasant garden, were also well-equipped, attracting part of the German Olympic team in preparing for the 1936 Games. This layout reflected Paulcke's philosophy on health, which emphasized physical activity, proximity to nature, and hygienic practices.

The stadium provided a much-needed venue for the burgeoning interest in university sports among Karlsruhe students as well as other interested parties, who had been calling for such facilities years before the stadium was constructed. It soon became a hub of vibrant sporting activity. University sports had meanwhile become obligatory under the responsibility of the first gymnastics and sports teacher in Baden, August Twele (1896–1985). It was further institutionalized with the introduction of a performance book for all students, which recorded their physical achievements each semester and later served as proof of physical fitness for career purposes. Starting in 1924, medical data — including height, weight, and alcohol consumption, for instance — was systematically recorded in special monitoring records on each student. ⁄161

Beginning in the mid-1920s, once a year the stadium became the spotlight of academic life at Karlsruhe on Academic Sports Day. This *dies academicus* evolved into an athletic festival, like at other universities, providing an annual showcase for students to demonstrate their physical fitness and health. Female students performed round dances; competitive performance was the prerogative of men. The rector proudly presided over the medal ceremonies, with students presenting themselves in formal or fraternity attire to show how much they valued receiving their accolades personally from the rector. "The academic sports festival with its mass exercises became a celebration for the academic family, during which sports competitions were held before the eyes of the entire enthusiastically attentive faculty and civil servants. Only the achievement of the fittest was what counted here […], teachers and students at one, united in harmonious camaraderie." ⁄162

By the 1930s, academic sports had evolved significantly. Many universities founded academic flying groups, and new disciplines such as grenade throwing, small-caliber shooting, cross-country running, or pack marches were added to the standard disciplines. ⁄163

Swantje Scharenberg

041 Sistrah Lamp (design 1931)

In 1931, the designer Carl Friedrich Otto Müller (born 1885) developed the Sistrah lamp in collaboration with the Institute of Light Technology at Karlsruhe Polytechnic. At that time, the institute was directed by Joachim Teichmüller (1866–1938), who had established lighting technology as a subdiscipline of electrical engineering at Karlsruhe. Teichmüller also created the Teichmüller sphere, a measuring chamber for lighting devices that allows the intensity of emitted light to be measured in all directions.

The goal in developing the Sistrah was to create a "universal" light source that provided maximum brightness completely glare-free and as energy-efficiently as possible. ⁄164 The lamps were designed in various models suitable for stores, restaurants, offices, doctors' offices, schools, and homes. They were available as pendant and floor lamps. Even a special version for billiard tables is featured in the 1932 brochure. The name "Sistrah" is derived from the first letters of the German phrase *"Sie strahlt hell"* ("It shines brightly"). This brand name was used for distribution in Germany, but the lamp was marketed internationally under the brand name Megaphos (meaning "great light").

Sales began in 1934 through the company *Sistrah-Licht GmbH*, a subsidiary of Müller & Zimmer. The Sistrah lamp quickly attracted considerable attention in professional circles due to its innovative technology. Its

enduring appeal is evident even today: vintage models command prices with four digits before the decimal point, and several versions continue to be produced. *as*

Sistrah lamp,
ca. 2015,
maker: MZ-Leuchten/Stuttgart,
ca. 42 × 50 cm,
mainly glass and nickel-plated steel.
Private holding.

↘ Research; Innovation;
Everyday Life and Culture

↩ 037

National Socialism and World War II (1933–1945)

042 Design of a “Thingstätte” (1934)

Thingstätten — named after historical sites where assemblies and court meetings used to be held — were conceived by the regional offices of the Reich Propaganda Ministry in 1934 as gathering places. The mass events there were intended to foster a sense of national unity in line with National Socialist ideology. Oversight of Thingstätten was the responsibility of the national association of open-air and recreational events, *Reichsbund der Deutschen Freilicht- und Volksschauspiele e.V.*, founded in 1933, directly accountable to Reich Minister Joseph Goebbels. Approximately 400 Thingstätten were planned, with detailed designs drawn up for 60 to 70 of them, though only a few were actually constructed. ↗ 165 Notable examples include the Waldbühne on the Olympic grounds in Berlin and the Thingstätte on Heiligenberg, a hill near Heidelberg.

Hermann Alker (1885–1967), a professor of architecture at Karlsruhe Polytechnic, who had previously designed the grandstand for the academic sports stadium, was commissioned to design the Karlsruhe Thingstätte shown here in a layout drawing. He was also responsible for designing and building the Thingstätte near Heidelberg. The Karlsruhe Thingstätte was planned to be at the northern end of a north–south axis that was to include the university stadium, a parade ground, and a fairground. The design envisioned a separation of the Thingstätte from the rest of the facilities by a small belt of woodland. The Thingstätte was to have a diameter of 120 meters and seat 10,000 in an amphitheatrical arrangement. The adjacent parade ground to the south and the fairground were to be situated near the existing stadium grandstand. The concept envisioned events with “mass choruses” of hundreds of people from among the “celebrating crowds.” ↗ 166 A total capacity of 17,000 to 20,000 people was estimated and construction was planned to begin by the end of 1935. ↗ 167 The Thingstätten movement was discontinued before it could proceed, however, due to a lack of sufficient support for its vision. *as*

Hermann Alker: Design for a “Thingstätte” near the stadium of Karlsruhe Polytechnic. Illustration from the newspaper article: Thingstätten der Südwestmark von R. Alker, in: *Volksgemeinschaft*, May 10, 1934, no. 136, p. 10.

↘ Everyday Life and Culture

↩ 040

043 Sign for the Oskar Stäbel House (presumably 1934)

The sign bearing the inscription "Comradeship House of Karlsruhe Students and the National Socialist German Student League, Oskar Stäbel House" presumably dates from 1934. It was probably affixed to what is now known as Franz Schnabel House on KIT's South Campus. Originally constructed in 1857 as a breeding station for the Grand Ducal pheasant garden and as a residence for the pheasant hunter, the building was repurposed after the Nazis assumed power. It was allocated to the National Socialist German Student League (NSDStB) intended to accommodate students at low cost with full board and barracks-style bunk beds similar to in the Reich Labour Service (Reichsarbeitsdienst), it reflected a militarized daily routine according to Nazi principles. This arrangement was part of the broader aim to bring private areas of life under state control, particularly within the university sector. The National Socialists sought to disrupt existing independent student structures by using the house as a base for the leaders of so-called comradeships, essentially student fraternities restructured along totalitarian lines.

This comradeship house was inaugurated in June 1934 and named after Oskar Stäbel (1901–1977), who was a prominent leader of the NSDStB and the German Student Union. Apart from studying mechanical engineering and writing his thesis at Karlsruhe Polytechnic, he rose rapidly in the NSDAP party and in the SA. Stäbel's term as Reichsführer of the NSDStB was cut short by the Röhm Coup a few weeks after the building's opening. In such circumstances its official name couldn't be kept.

Following World War II, the building was renovated and initially served as the Carl Engler and Hans Bunte Institute of Mineral Oil and Coal Research. By the late 1980s, it housed institutes from the Department of Humanities and Social Sciences. In 1992, it was renamed in honor of the historian Franz Schnabel (1887–1966), who had been persecuted by the Nazis. *kn*

Sheet metal sign,
ca. 1934,
156.5 × 75.0 × 2.0 cm,
copper.
KIT Archives 28506/27.

↘ Teaching and Academic Study; Everyday Life and Culture

↩ 044

044 Protest against the Removal of History Professor Franz Schnabel (1936)

In early 1935, the Law on the Dismissal and Transfer of University Teachers, Enacted as Part of the Reorganization of the German University System, authorized the National Socialist regime to reassign or abolish professorships. The structure and staffing of academic institutions were thus subject to the orders of the Reich Ministry of Science, Education, and National Culture. Against his will, the historian Franz Schnabel (1887–1966) was relieved of his duties at Karlsruhe Polytechnic in June 1936. His publications had revealed him as an opponent of National Socialism. Officially, this action was justified as intending to strengthen military content in the Polytechnic's curriculum.

Protest against Schnabel's dismissal took the form of a typewritten postcard, signed as by "Many," which was received by the Polytechnic's administration on October 10, 1936. Rector Rudolf Weigel (1899–1955) forwarded the postcard, posted from Ludwigshafen am Rhein, to the Ministry of Culture "for possible further action by the Gestapo." ↗[168] This move demonstrated Weigel's effort to be recognized as a vigilant supporter of the regime.

After his removal from academic service, Schnabel lived on a pension and continued to work on the fifth volume of his German history in the nineteenth century, *Deutsche Geschichte im neunzehnten Jahrhundert*. The Nazi regime blocked the publication of this work. A building on KIT's South Campus has been named in Schnabel's memory since 1992. *kn*

Anonymous postcard to Karlsruhe Polytechnic,
undated,
received on October 19, 1936.
General State Archives, Karlsruhe, 235/2478.

↘ Research; Teaching and Academic Study

↩ 043

Maneuvering Room during the Dictatorship

The terse protest note regarding the dismissal of Karlsruhe historian Franz Schnabel, received on October 19, 1936, raises numerous questions about the nuanced relationship between conformity and non-conformity in the Nazi academic system and the interplay of domination, self-regulation, and partial autonomy within universities under the Nazi regime. In recent decades, historians have explored this complexity and ambivalence, focusing less on exemplary entanglement or exemplary resistance, and more on the scope of action within the given context.

The five-line protest, presented in a single sentence, reflects a characteristically bourgeois academic

style. This style claims the authority of scholarly competence and interpretive sovereignty. It was precisely this German nationalist professorial pathos — viewing the German *"Volk"* as ultimate legitimation, and presuming to speak in Germany's name — that facilitated and encouraged the early establishment of National Socialism among the Karlsruhe student body and faculty. The protest was not directed against the unjust state as such or the violation of law affecting Franz Schnabel personally, but rather against an infringement on the professional rights of the academic elite, an injury to their self-image. This is expressed in the tone of offended complacency in which this is interpreted as "a sign of Germany's decadence in academia." Schnabel is perceived not as a disenfranchised colleague or fellow human being, but as "a prominent scholarly force," a reduced member of their rank.

In contrast, the rector's response is far more political and modern — in the sense of the "Führer state" model. Weigel's suggested "possible further persecution by the Gestapo" is an example of preemption, what was called "working toward the Führer" during the Nazi era. Thus room was made for maneuver. ↗ 169

Rolf-Ulrich Kunze

045 Promotional Film for Engineering Studies (1937)

In the years leading up to World War II, the number of students at Karlsruhe Polytechnic declined sharply. Compared to approximately 1,200 enrollments per semester in the 1920s, the academic teaching load had halved. To address this concerning trend, a promotional film was created to attract students to the Polytechnic. The screenplay was written by Mechanical Engineering Professor Otto Kraemer (1900–1986). The 68-minute black-and-white film in 16-millimeter format presented local academic members and was largely filmed on campus and in Karlsruhe. It was produced as a silent film with intermittent explanatory captions. A narration was also prepared for live presentation.

The film follows the journey of an engineering student through to his early professional achievements. It highlights the advantages of studying in Karlsruhe, the city's charm, the allure of the Black Forest, and not least the career opportunities available after graduation. The Polytechnic is portrayed as an institution integrated in the National Socialist state. This is evident in scenes showing the rector, Rudolf Weigel (1899–1955), in NSDAP uniform and wearing the chain of office, surrounded by other uniformed figures. One caption underscores the conformity with National Socialist ideology by defining the engineer as an implementer of "the Führer's plans." *kn*

Scene from the movie: *Ingenieure heraus! Ein Film vom technischen Hochschulstudium*, Engineers, Step Forward!),
director: Karl Georg Schmidt,
script: Otto Kraemer,
cinematography and editor: L. Koch,
lighting: Otto H. Knoll,
68 minutes,
16 mm, black-and-white,
silent with voiceover commentary.
KIT Archives 28504/52.

The upper scene on page 137 enacts the handshake between Rector Rudolf Weigel and the student, during the matriculation ceremony (25:49–25:57). The actors are the rector of Karlsruhe Polytechnic, Rudolf Weigel, and the student Carl August Landfermann

↘ Teaching and Academic Study; Everyday Life and Culture

↩ 032; 049; 050

046 Racist Pamphlet on Heinrich Hertz (1938)

The Student Association (*Fachschaft*) for physics at Karlsruhe Polytechnic participated in the vocational competition, *Reichsberufswettkampf* posted in 1937, with an essay titled "Heinrich Hertz – His Endeavors and Achievements with Special Consideration of His Racial Ties." The title alone indicates that these aspiring physicists, ventured beyond their academic domain to try to interpret Heinrich Hertz's groundbreaking work in Karlsruhe through the lens of ancestral heritage. The authors of the essay, closely supported by their academic mentors, sought to distinguish between Hertz's research results, deemed objectionable on racial grounds rooted in the Aryan ideology of "Deutsche Physik," and his otherwise outstanding scientific achievements. They attributed Hertz's experimental proof of the similarity between electromagnetic waves and light waves to his "Aryan" heritage, while dismissing his theoretical contributions as influenced by his Jewish ancestry and therefore *"artfremd,"* alien to their conception of a German species.

The concept of race, particularly when applied to humans, is outdated as a scientific category. Holding a scientist's ancestors accountable for specific aspects of his work is baseless speculation. Conducting science within a limiting frame defined by racist self-identification, deliberately set apart from the rest of humanity, highlights the absurdity of such an attempt, clearly crafted to serve as a showcase for the National Socialist regime. The competition submission is a thought-provoking

example of how easily and quickly scientific inquiry can descend into ideological delusion. *kn*

Werner Gaedcke, Friedmar Grundig, Walter Hodapp, Walter Hublow, Willi Schramm, Alfred Winkels, Emil Ziegler: *Heinrich Hertz in seinem Wirken und Schaffen unter besonderer Berücksichtigung seiner rassischen Gebundenheit*, 1938,
mimeographed typescript.
KIT Archives 27104/11.

↘ Research; Teaching and Academic Study; Everyday Life and Culture

↩ 022

047 Personnel File on Professor Rudolf Weigel (1932–1972)

Born in Bretten, Rudolf Weigel (1899–1955) passed the examinations for a *Diplom* degree in electrical engineering from Karlsruhe Polytechnic in 1923, earned his doctorate in engineering in 1930, and submitted his habilitation thesis there in 1931. Initially, this thesis was rejected by the reviewers. One critic pointed to the lack of scientific explanations for the series of measurements Weigel presented on the transparency of glass. The habilitation proceedings dragged on into the period following the National Socialist takeover in spring 1933. In addition to presenting his scientific arguments in defense of his habilitation thesis, Weigel also highlighted his longstanding support for the National Socialist cause, suggesting it as an influencing factor on an outcome in his favor. His habilitation was ultimately approved — the special relationship he had established with the head of the university division at the Baden Ministry of Education and Cultural Affairs, as a valuable informant about anti-Nazi sentiments among his colleagues in Karlsruhe, may have helped. ↗[170] In 1934, Weigel was appointed Associate Professor of Lighting Technology at Karlsruhe Polytechnic. By 1937, he had been promoted to rector and soon afterwards acquired full tenureship. This career illustrates how political attitudes significantly influenced the filling of top academic positions under National Socialism. *kn*

Personnel file on Professor of Lighting Technology Rudolf Georg Weigel.
KIT Archives 21011/538.

↘ Research; Teaching and Academic Study

048 Instrument for Measuring Carbon Dioxide Content in Room Air (1943)

This CO_2 measuring device dates back to 1943 and was discovered in a basement room at KIT, which presumably had served as an air-raid shelter during World War II. In a crowded air-raid shelter, measuring the CO_2 content of the air was potentially vital, as the oxygen could quickly become depleted when many people were staying there.

The instruction manual reveals that operating the device was complex and prone to error. Even just initially setting it up involved six steps, and the part on "conducting a room air test" added five more. ↗[171] Proper use of the device surely required practice, especially during an emergency. After fanning the room air into the device, it had to be sealed tightly. Inside, tissue-paper disks drenched in alkaline lye absorbed the CO_2. This created a negative pressure that was displayed on an oil scale connected to the measuring chamber. The higher the value on the oil scale, the poorer the air quality. Measurements had to be taken regularly, as the device only displayed the momentary air quality.

Most of the buildings of Karlsruhe Polytechnic were heavily damaged during the air raids. Mechanical Engineering Professor Rudolf Plank (1886–1973) noted in his memoirs about the year 1944: "The tragic end of the 'thousand-year Reich' became apparent to all those with insight, but the Party was still making a big show of itself. The bombing raids on German cities multiplied, and the civilian population was fully engaged in the war. University teaching and academic work almost completely ceased, and the bunkers had to be visited more and more frequently." ↗[172] *as*

Instrument for measuring carbon dioxide in room air,
maker: Drägerwerk/Lübeck,
ca. 14.0 (diameter) × 15.0 cm (excluding the container),
metals, glass, paper, etc.
KIT Archives 28509/4.

↘ Everyday Life and Culture

049 Secret War Research (1944)

In the file on the award of a doctorate to the meteorologist Emil Frank (born 1913), the title of his dissertation *"Aerosol"* in 1944 stands out. Doctoral theses often employ complex, compound vocabulary and interposed conditional clauses in their titles to describe their topic, in order to plot the object of inquiry within the proper disciplinary parcel. The short title used for this thesis on the file cover and on the doctoral certificate served to maintain secrecy. As an employee of the Greifswald Naval Observatory, Frank focused on the artificial dissipation of a specific aerosol — fog — a persistent everyday issue, and most especially so in wartime. Fog removal was particularly relevant in aviation, where it was essential to keep runways clear. The assigner of the task, which was carried through all the way up to the development of a "large main apparatus," the Naval Observatory, exposes the military relevance of Frank's thesis. ↗ 173 The primary supervision and reviewing of Frank's dissertation, by Franz Wolf (1898–1984), a physics professor at Karlsruhe Polytechnic, exemplifies this institution's involvement in war research. *kn*

Doctoral certificate from
Karlsruhe Polytechnic,
March 18, 1944.
KIT Archives 21013/1069.

↘ Research

↩ 032; 045; 050

050 Reminiscences by Contemporaries about Studying under National Socialism and in the Postwar Period (2012 und 2015)

Members of the KIT Archives and Alumni Organization conducted interviews in 2012 and 2015 with contemporary witnesses. Annemarie Heimann (born 1919) and Hilde Becht (born 1925) related their experiences studying and working at Karlsruhe Polytechnic during the National Socialist era and the subsequent postwar period. These recorded interviews provide insights into various aspects of academic life and work at Karlsruhe, including teaching operations, the daily routine, and their experiences of the Nazi regime. They still vividly remembered the relocations of the Institute of Applied Mathematics and the Institute of Physical Chemistry and Electrochemistry shortly before the end of the war, as well as the early days of the occupation. Dramatic moments, such as the day after the pogrom "Night of Broken Glass" of 1938 and the bombings come alive again, along with many more mundane aspects of life at the Polytechnic. These very personal accounts not only detail their experiences but also illuminate the related fates of fellow students and professors. The digital presentation of this exhibition, which is available alongside the present publication, features selected excerpts from the interviews. This volume makes a selection of contemporary photographs and quotes from these conversations to offer a glimpse into the wealth of information conveyed by such interviews. The audio recordings are permanently stored at the KIT Archives and can be accessed or obtained there. *kn*

Interview with Annemarie Heimann,
née Geierhaas (*1919),
April 13, 2012,
76 minutes.
KIT Archives 28503/177.

Interview with Hilde Becht, née Trapp (*1925),
December 3, 2015,
83 minutes.
KIT Archives 28503/180.

↘ Research; Teaching and Academic Study; Everyday Life and Culture

↩ 028; 032; 034; 045; 049; 053

Annemarie Heimann 2012 in Conversation about Her Chemistry Studies from 1938 on

"Well, I passed my exam at Fichte Preparatory School and then decided on chemistry. My dream actually was history of art, but since my family was not in the Nazi direction — my father had been dismissed from his management position for political reasons already in [19]33 — , we realized that studies in the humanities or arts were all being steered. The exhibition "Degenerate Art" (*Entartete Kunst*) had already taken place in [19]37. So I decided, also based on my abilities in sciences, to study chemistry. I always said to myself: Hitler can't change H_2O. And then I started my studies here in chemistry. There were just two of us girls who enrolled then."
[…]

"When the raids became more frequent, two students always had to stay overnight in the institute in case incendiary bombs were dropped, to throw them out and so on. I then joined together with Miss Meier, that was the secretary at the time […], Else Meier, so that we two girls could overnight together. And thank God there never was any attack on our watch at night."
[…]

“There were always very short attacks by day then, very targeted bombing, that means, always the […] Polytechnic; one time, a dud landed in Physical Chemistry, in the institute, and — this is really strange — the lecturer was standing exactly at the spot where it came down — dead, a Dr. Skrabal.”
[…]

“Well, that was already 1943. The air raids became more and more frequent, massive. I remember, in the morning — the raids were often at night — you’d bike to the university to drop in on your friends and look to see if they were still alive, or if you could help clear up, or the like. I remember well, one morning I rode down Beiertheimer Allee, phosphorous was trickling all over the place on Ritterstraße, you had to be careful not to get it on the bike because it would have immediately set everything on fire. And when you arrived at the university, something was always in ruins […]. Then you first spent half a day sitting on the roof, we worked together putting the shingles back in place and taping up the windows […]. And finally, I think it was the big September raid, when we arrived in the morning, everything was in ruins.”
[…]

“There was a slit trench in Hardtwald then, where Physics now stands. You ran over there and stayed until the planes were gone again. And then, finally, there was this huge attack, and all of our things were in shambles. For me personally that was especially painful, because all my preparations I had been working on for months were gone overnight. Everything gone.”
[…]

“But I still have another very devastating experience from that time. That was already during the first semester, [19]38, November. That was the Night of Broken Glass. And that day […] I already saw as I was biking in […] that the fire brigade had stopped on Karl-Friedrich-Straße. I didn’t know at all that behind the Braun Publishers building, where the bakery now is, that there was a synagogue back there. It had been set on fire […]. And then afterwards, also on Kronenstraße, that big synagogue. I already saw that as I was coming in. They were still burning […]. And then on that day […] I went with my classmate […], with Maria Meter, to the mineralogy lecture. She had chosen that as a minor. I said, I’ll come along with you and listen in on it. And that lecture hall was just above the main entrance. Stepped seating, with benches. And we could see directly across onto the sidewalk on the other side of the street. […] And you could look down very well. Suddenly — the professor wasn’t there yet — there was shouting. And a mob on the sidewalk on the opposite side was driving a Jew in front of them, hooting and yelling, he was in hat and coat, ready-dressed for the cold, his hands raised. All the Jews were driven onto the market place. That was bad enough as it is. But then came the terrible thing. A woman was biking toward the market place to Durlacher Tor, got down, walked up to the sidewalk leading her bike, and slapped the Jew in his face. It was so awful that I only thought, how much worse can it get, if women do such a thing? She hit the defenseless man in the face. That was one of the worst things I saw.”

Hilde Becht 2015 in Conversation about Her Work as an Assistant at the Institute of Applied Mathematics from 1943 under Professor Wolfgang Haack (1902–1994)

So, you said before, that you had the apparatus and libraries in the basement?

HB “We had gotten them out, and foremost the files too, on what had already been calculated and signed. […] It is actually strange that after such a large attack that so much is still there. But every evening […], when we were done working, you had to take everything down into the basement. […] And that was, of course, what saved it.”

You told us that you also did drafting. What was being drafted?

HB “The missiles. […] I worked for about one year on a missile — Meridian was what it was called then — from V2. That is also later, that shooting range was in Peenemünde, that’s where they were tested. And that was a very big drafting board, and the missile was on top of it, the central axis and then practically the sheathing, that is for this so-called Meridian. And the measurements from the central axis to the outside were always solutions of 20 unknowns. Namely, there was resistance, the air resistance was taken into account, at supersonic speed. And that thing called itself *Optimal Meridian with Base Drag*. Since the rear end of the missile was [cut]away. And that then caused a kind of pull at the back end. And that too has to be calculated, because it also causes resistance. And so, I had to calculate a whole year long. That was terrible. And the numbers were always six digits, that is, zero point and then five digits at the end. And after that year these results were applied, as one used to do […] with two unknowns. The results were then plugged into the first calculation, and then everything was supposed to work and come out even. And then of course it didn’t quite work. But then my boss said he would have expected as much, that with six digits it couldn’t agree exactly, but that was okay anyway, it was precise enough.”

Was that computed with calculating machines?

HB “There was this Brunsviga then. […] You set it, and then you had to turn, either forwards or backwards, depending on whether for addition or subtraction or division […]”

[On moving the Institute away to Großalsleben, southeast of Magdeburg, and war's end]

HB "On September 27th [1944] was the attack, when the main auditorium was ruined. And then on December 4th 1944 was the big raid on Karlsruhe. And then Professor Haack pulled up the anchor and drove away with all the rest of the Institute to Großalsleben. That is, by freight train, with files, calculating machines and the Chair's library. And at Großalsleben he had an aunt [...]. And there was a stately domain in Großalsleben. And that's where he requisitioned a room for the calculations, and one for him to live in with his wife. And I was able to live with my mother in a farmhouse across from it."
[...]

"A few days before Christmas 1944 and in April 1945 the Americans arrived. [...] Then the other student and I were obliged, if the Americans marched in, to come immediately and burn the files [...], so that they don't fall into enemy hands. Well, then the American tanks rolled down main street and we two young girls rushed away from our apartment [...]. We arrived there safely and started setting a fire. Then a general of the Americans came and stopped everything, immediately loaded up everything, all the files, calculating machines, together with Professor Haack and his wife."

And did this general already know whom he had to look for?

HB "He knew everything. The spying worked beautifully. They had accurate information, where we were calculating and where these files were. He took it all away and Professor Haack with his wife for five years to Bad Gandersheim. And there was a kind of scientist's colony over there. Wernher von Braun was also there among others. [...] And there they had to continue the calculations on the same things."

Karlsruhe Polytechnic in the Postwar Period (1945–1967)

051 Dedicatory Sign by the 106th US Infantry Division for the Stadium of Karlsruhe Polytechnic (presumably 1945–1950)

After the victory of the Allies and the fall of the Nazi regime, Karlsruhe Polytechnic faced numerous challenges and new obligations. Many of its buildings had been destroyed, and some faculty members had been dismissed or imprisoned due to their involvement with the Nazis. The institution's new administration, led by Rudolf Plank (1886–1973), received official permission from the American military government to resume classes in the summer semester of 1946. One notable deviation from normal academic operations was the requisitioning of its sports facilities, built in the late 1920s, by parts of the 106th US Infantry Division. After initial French occupation, Karlsruhe and a northern part of Baden became part of the American occupation zone in mid-1945.

The sign shown here created by the Americans indicates their chosen name: Ardennes Stadium, for the facility they had taken over. It was a dedication to their comrades who had been killed, wounded, or gone missing during the Battle of the Ardennes. At the turn of the year 1945, German forces had launched one of their last major offensives in this region, only to be defeated by superior Allied forces.

The departing occupying power left this clearly hand-made sign behind. It is perhaps the sole vestige of the presence of Allied troops on campus at KIT. *kn*

Dedicatory sign,
85.5 × 60.5 × 0.8 cm,
tinplate on wooden panel.
KIT Archives 28506/30.

↘ Everyday Life and Culture

↩ 040

052 Tribunal Verdict (1947)

This notice to the professor of apparatus engineering, Emil Kirschbaum (1900–1970), is a typical example of the outcome of denazification in academia. Kirschbaum was classified as a "fellow traveller" after the arbitration tribunal determined, based on his statements, "that he had participated in N[ational] S[ocialism] no more than nominally and had supported it insignificantly at best." After the fall of the Nazi regime, the denazification process was intended to ensure that rebuilding efforts proceed without the influence of former National Socialists. Millions of questionnaires were dis-

tributed, requiring individuals to disclose their affiliations with Nazi organizations. The tribunals established for denazification were lay courts, with procedures that broadly resembled those of criminal trials. A prosecutor gathered incriminating evidence, the accused persons had the opportunity to defend themselves and call witnesses to vouch for their character. The outcome of these proceedings often hinged on the testimony of these supporting witnesses, making the strength of an individual's social connections a decisive factor in the tribunal's verdict. Consequently, the records from such proceedings frequently provide an incomplete basis for assessing whether the decisions were appropriate. *kn*

Tribunal verdict on Emil Kirschbaum,
dated July 23, 1947.
KIT Archives 21011/209.

↘ Research; Teaching and Academic Study; Milestones in KIT's History

Two Views on Denazification

A glance through the denazification files on academic teachers often elicits a shake of the head. Although historical research has shown that German institutions of higher education and their professors had compromised themselves in many ways, these files paint a seemingly quite different picture.

Even the most prominent National Socialists managed to provide exonerating affidavits — some of them very credible. They attest to the predicament in which professors felt subject to coercion, to only reluctant joinings of the party (NSDAP) and other Nazi organizations, to their rejections of the system through everyday gestures or in confidential conversation, and to their support for individuals persecuted by the regime. The central claim of professors was that they had always acted strictly professionally, unswayed by political influence at their institutes.

The Karlsruhe professor of apparatus engineering, Emil Kirschbaum, also presented good character references. These affidavits were colloquially known as *Persilscheine* (whitewash certificates), as many Germans managed to use them to bleach out the most persistent "brown stains" from their supposedly pristine reputations. In the denazification trial courts, which historian Lutz Niethammer characterized as a "follower factory," these testimonies helped transform millions of NSDAP members into innocent bystanders.

On July 23, 1947, Kirschbaum was deemed a "fellow traveler" based on such whitewash certificates — despite his former memberships in the NSDAP and the National Socialist Lecturers' League, as well as his presumed role as a staff member of the lecturers' leadership, the Dozentenführer.

The distorted picture painted by the tribunal files led to denazification being generally regarded as a failure. In a certain respect, this is on the right track: No political process could ever repair the break with civilization caused by National Socialism. No punishment could ever make amends for injustice and betrayal.

Denazification is criticized not just in retrospect. Contemporaries also vehemently rejected the proceedings. Calls for closure came early, and the occupying powers also quickly shifted their priorities as the Cold War intensified.

Yet denazification did have a constructive side. It allowed Germans, including professors and universities, to distance themselves from National Socialism, although this was largely based on a dishonest reinterpretation of the past. At the same time, Emil Kirschbaum's conformity as a "fellow traveler" was clearly put to official record as "political guilt" and punished. Finally — and this is sometimes overlooked — denazification also did in fact lead to the removal of certain Nazi figures, such as Rudolf Weigel, the National Socialist rector of Karlsruhe Polytechnic.

Given this ambivalence, the often-maligned "follower factory" helped prevent National Socialist ideas from gaining foothold at colleges and universities after 1945 and facilitated a gradual return to the international scientific community.

Anton F. Guhl

053 Travel Diary (1951–1952)

A diary, together with various photo albums, documents Maria Fischer-Gieselmann's scholarship trip through the United States from October 16, 1951, to January 8, 1952. In May 1950, the young architect had passed her examination for a *Diplom* at Karlsruhe Polytechnic and subsequently gained her first professional experience. During Maria Fischer's studies, she was not the lone woman among male students in Karlsruhe anymore. Among the 278 architecture students who successfully completed their exams between the end of the war and the summer semester of 1950, 21 were women (7.6 %).

The Women's Bureau of the US Department of Labor arranged for Maria Fischer and her fellow in the profession, Dorothee Keuerleber, to travel through the USA as "expert[s] for women's affairs." The purpose of this sponsorship was to spark ideas and inspiration for use at home. The trip was tightly scheduled. The two young women visited many institutions, cities, and private homes. They also attended numerous lectures and other educational activities. The program, catering to young women, also included visits to several women's clubs, such as the League of Women Voters, as well as schools

and hospitals with maternity wards. Fischer describes her impressions overall as varied but also somewhat strange. She missed having more practical opportunities in the USA, as the focus of her trip had been on observation rather than hands-on experience. After returning, Maria Fischer established herself as a freelance architect. In the early postwar period, there was a notable trend toward offering exchange programs for German students to the United States. The goal was, to reintroduce Germans, shaped by National Socialism and the war, to democracy and life in liberty. Although women were still underrepresented in technical degree programs, this diary illustrates that efforts were already being made to promote them during the 1950s. *as*

Travel diary by Maria Fischer,
October 16, 1951 – April 24, 1952,
34.5 × 30.0 × 6.5 cm,
album illustrated with photographs and texts,
saai | Archive for Architecture and Engineering at KIT, GIESM.

↘ Teaching and Academic Study;
Everyday Life and Culture;
Call for Objects

↩ 028; 034; 050

Object proposal
I suggest this object because the history of women like Fischer-Gieselmann and her relations with KIT has largely remained in the dark. Although Karlsruhe's KIT was a "Kerlsruhe" — a guy's den — for so long, that doesn't mean that women didn't play a role in its history.
Rixt Hoekstra

054 Eiermann Table (ca. 1955)

Egon Eiermann (1904–1970) is recognized as one of the most influential architects of postwar modernism. He held a professorship in architecture at Karlsruhe Polytechnic from 1947. Eiermann gained prominence not only for his notable architectural works, such as the new extension to Kaiser Wilhelm Memorial Church in Berlin (1957–63) and the parliament building of the German Bundestag in Bonn (1965–69), but also for his furniture designs, many of which are now considered classics of German design.

The first version of the renowned Eiermann table was created in 1953, when Eiermann needed a practical worktable for himself. His design quickly garnered enthusiasm from students and colleagues, leading to the production of a small series of these tables for individual use in the workshops of the Department of Architecture. The original table has a welded tubular steel frame with a cross-brace inserted at an angle. In 1965, a version that could be taken apart was developed under the initiative of Eiermann's assistant, Klaus Brunner. This version was also made in the workshops on site for individual needs and was not commercially available. Adam Wieland — who became head of the metal workshop for the Chair for Foundations of Architecture in 1963 — refined the design further by positioning the cross-strut vertically.

Initially produced for students and faculty, these tables are still in use in various locations at KIT, found in offices and workshops across campus. In 1995, the rights to the product name "Eiermann" were acquired by a furniture manufacturer. Since then, the tables, offered in several variants, have become a sought-after item in high-end interior design. This table earned the Eiermann name a level of recognition that often surpasses the architectural work for which he is known, which today is sometimes considered somewhat dated. *as*

Drawing table [E1],
design: Egon Eiermann,
maker of the frame: metal workshop of the Department of Architecture at the Faculty of Building Construction, Karlsruhe Polytechnic,
ca. 1955,
frame 112.0 × 80.0 × 62.0 cm,
removable tabletop 200.0 × 99.7 × 2.6 (resp. 8.0 cm with reinforcements) cm,
lacquered steel piping and glued laminated timber with paper covering.
saai | Archive for Architecture and Engineering at KIT, EE_Moe_52.

↘ Everyday Life and Culture;
Call for Objects

Object proposal
To this day, no student has left the KIT Department of Architecture without ever having sat near, stood by, or worked at an "Eiermann." It is still an important piece of basic furnishing for all studies at the Department with its workplaces for drafting, practical exercises, and final projects. The "Eiermann" is put to task quite a bit. Many offices and seminar rooms in the specialty fields are also furnished with them. During the day, each frame carries its own tabletop, at night — such as, for awards or departure celebrations — two "Eiermen" were sometimes set upright next to each other with just one board on top as a drinks bar.
Kerstin Bausch

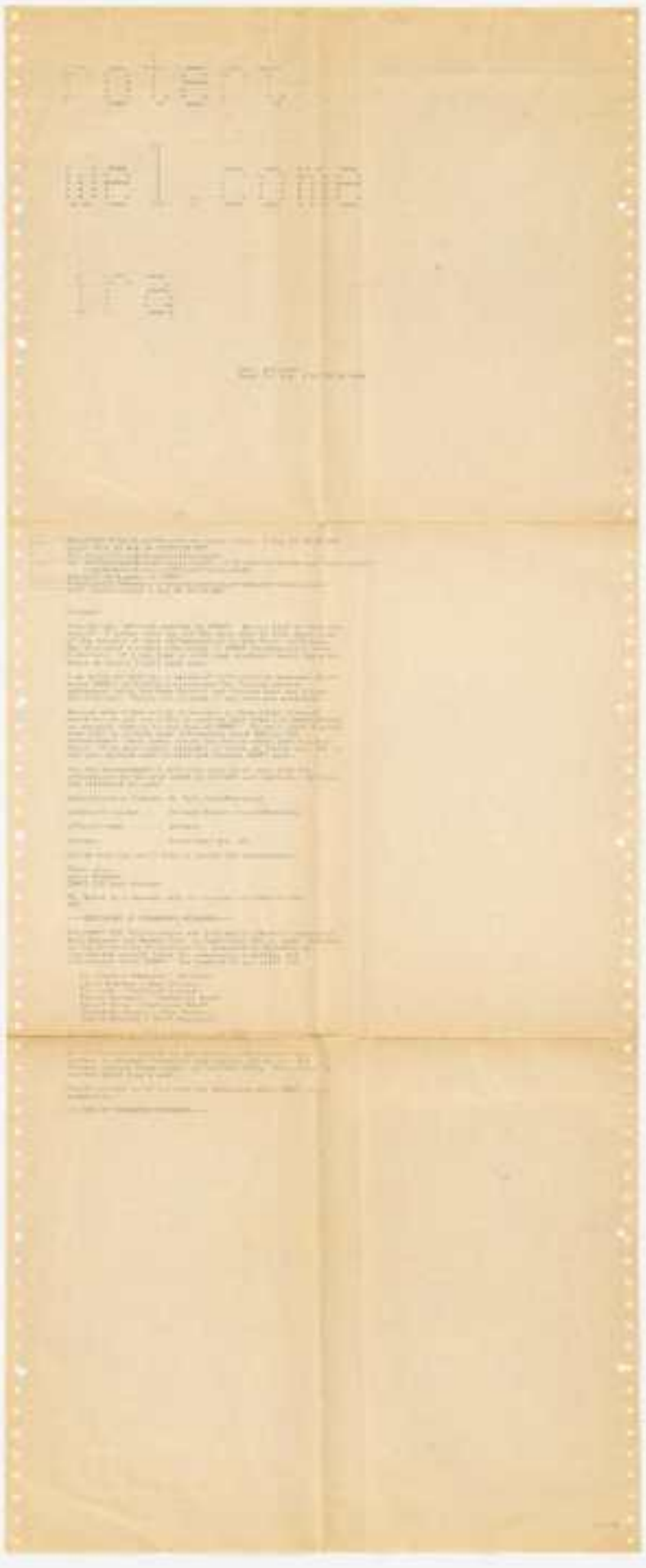
077 Noose 1979

→ p.305



078

First Email Received in Germany According to the Internet Protocol 1984



→ p.306

Received: From Csnet-Sh.arpa by csnet-relay; 2 Aug 84 12:35 EDT
Date: Thu, 02 Aug 84 12:21:58 EDT
To: rutert%germany@csnet-relay.csnet
cc: zorn%germany@csnet-relay.csnet, vic%csnet-sh.arpa@csnet-relay.csnet,
breeden%csnet-sh.arpa@csnet-relay.csnet
Subject: Wilkommen in CSNET!
From: Laura Breeden <breeden%csnet-sh.arpa@csnet-relay.csnet>
Via: csnet-relay; 3 Aug 84 10:14-MET

Michael,

This is your official welcome to CSNET! We are glad to have you aboard. I gather that you and Dan were able to talk about some of the details of your implementation at the Paris conference. Dan also said you were interested in CSNET paraphernalia (like t-shirts). If I can come up with some stickers (about the only thing we have), I will send them.

I am going to send you a series of informational messages about using CSNET, including instructions for forming network addresses, using the Name Server, and finding your way around the Internet. Please let us know if you have any questions.

Because some sites act as forwarders or have other internal concerns, we ask new sites to confirm that they are ready before we announce them up to the rest of CSNET. In your case, I would also like to include some information about DFN in the announcement (what hosts are on it, how to reach them via your host). From your recent messages it looks as though your VAX is the only machine able to send and receive CSNET mail.

For the announcement I will also want to be sure that the information on the site sheet is correct and complete. We show the following for you:

administrative liaison	W. Zorn (zorn@germany)
technical liaison	Michael Rutert (rutert@germany)
official name	germany
aliases	karlsruhe, uka, dfn

Let me know how you'd like to handle the announcement.

Thank you,
Laura Breeden
CSNET CIC User Liaison

PS Below is a message sent to liaisons introducing the CIC.

----BEGINNING OF FORWARDED MESSAGES----

The CSNET CIC (Coordination and Information Center), located at Bolt Beranek and Newman Inc. in Cambridge, MA, is under contract to the University Corporation for Atmospheric Research to provide the central focus for questions, problems, and information about CSNET. The members of our staff are:

Dr. Richard Edmiston - Director
Laura Breeden - User Liaison
Dan Long - Technical Liaison
Dennis Rockwell - Technical Staff

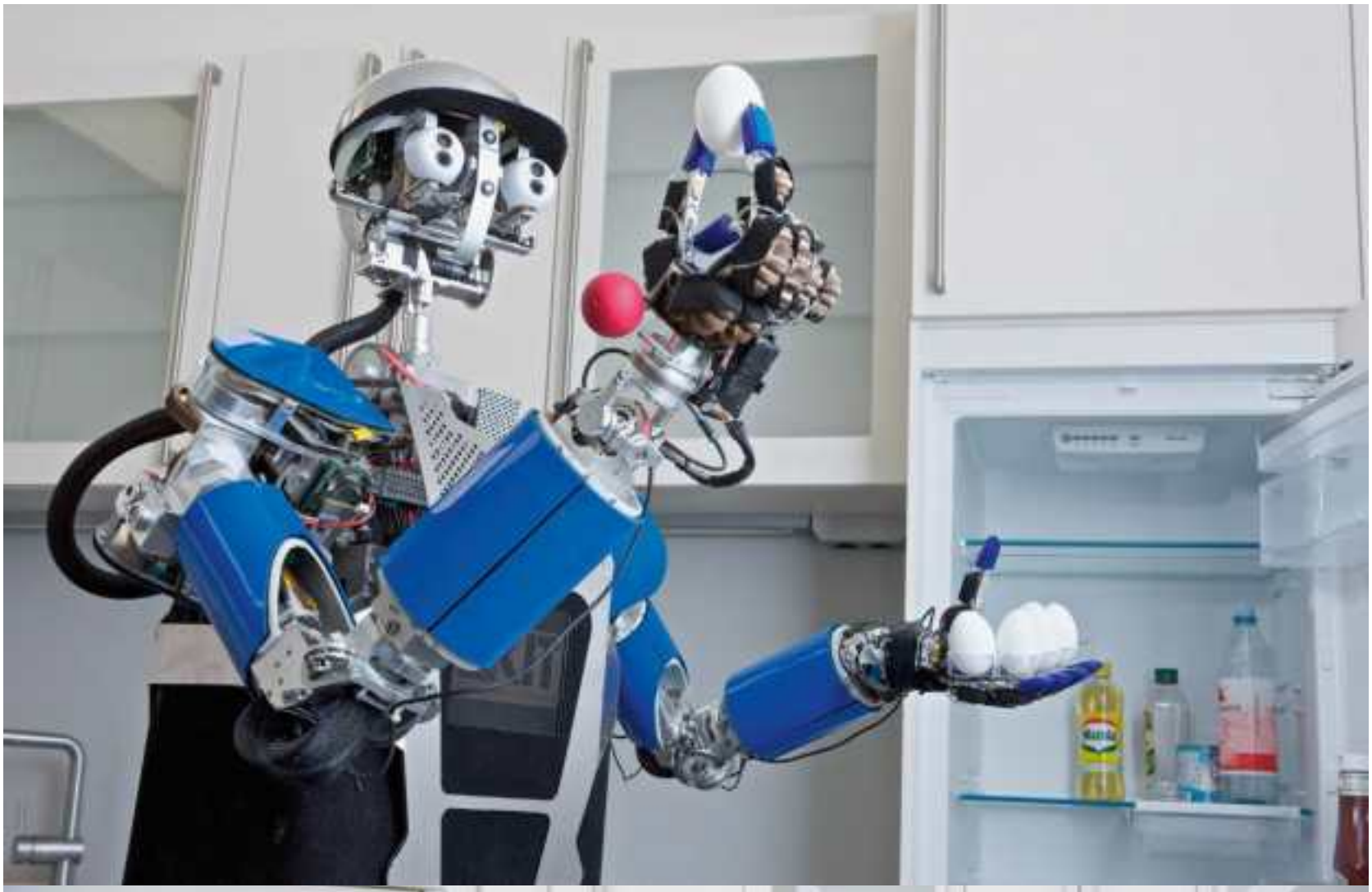
Student Periodical
“Schärfer bitte!” 1997

→ p.307
↩ 021




Ophasmus 97


UNIVERSITÄT KARLSRUHE
*07.10.1825 †01.10.2009
rip.edu.tr



KIT

083 Arrangement of International Visitors' Gifts ca. 1955–2020



→ p.310



084 Drinking Cup of a Traveling Researcher 2022



→ p.310

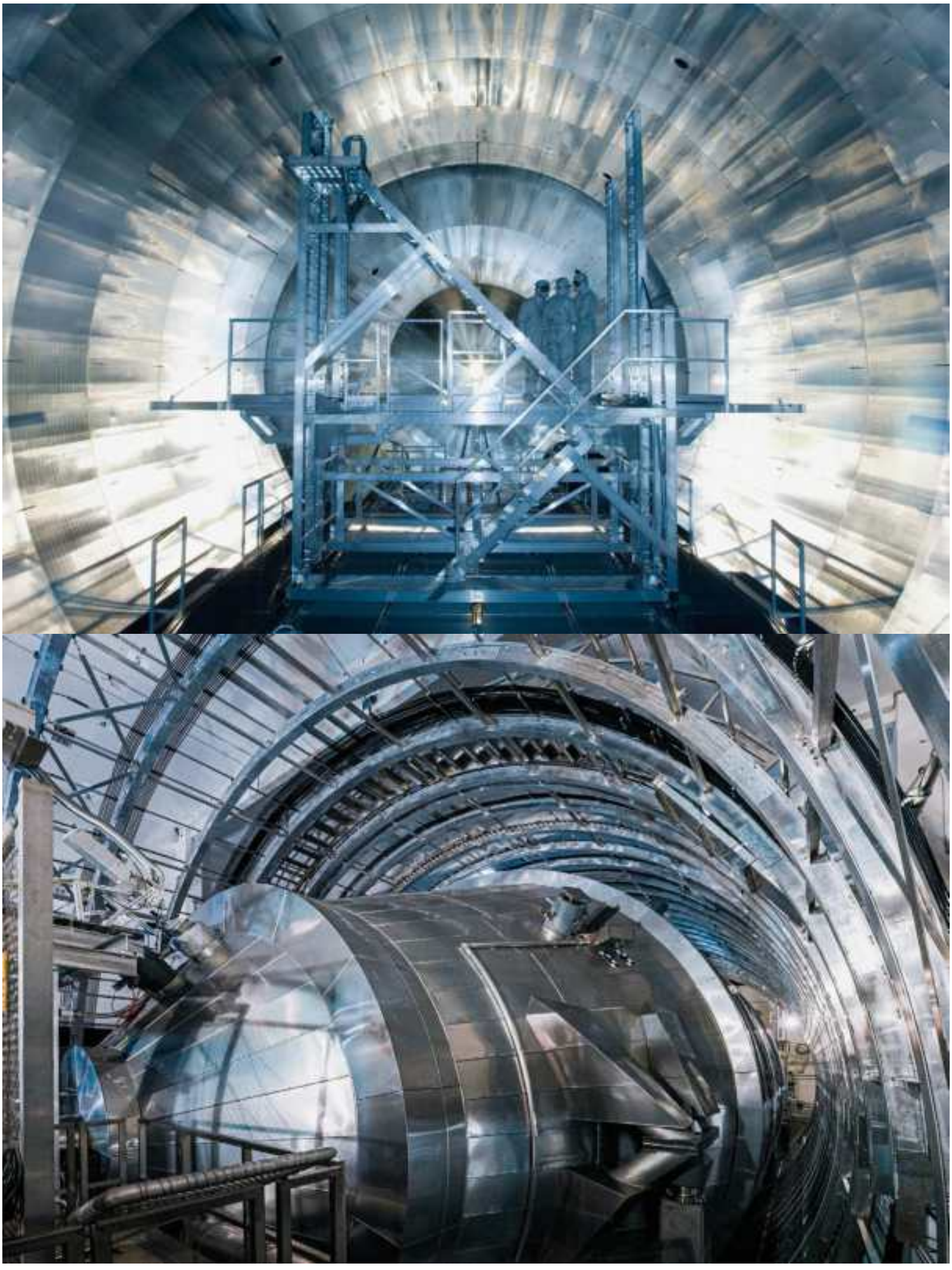


085 Precision Balance for the Lightest Elementary Particles 2018





→ p.311



086 The KIT Backpack ca. 2015 → p.311



270 KIT

High-Performance Computing Center 2023

→ p.312
↩ 076



088 Big Tam-Tam 2020 → S.312



272 KIT

055 Briefcase for Confidential Documents (ca. 1910)

This heavily patented leather briefcase was utilized by civil engineers at Karlsruhe Polytechnic for approximately 40 years to transport documents securely. The embossed Art Nouveau legend 'Engineer's Department' ("Ingenieur Abteilung") dates back to the time before 1937, when the university's organizational units were still referred to as departments rather than faculties. This briefcase accompanied Karlsruhe's civil engineers through various political regimes, from the German Empire and Weimar Republic, to the Nazi state, the Allied occupation, and finally the Federal Republic of Germany. Throughout these epochs, the methods of communication remained constant. Unlike email files today, which are often encrypted, official letters, private correspondence, minutes, and expert opinions were not coded in transit, even if they were confidential — much like faculty mail. Instead, these documents were transported in a briefcase secured with a lock. The circulation label on it lists the intended recipients of the dispatch. While the means of ensuring confidentiality — locking and encrypting — serve similar purposes, there is a significant technological gap between preventing physical access to a written document on paper and encrypting an electronically transmitted string of characters using an algorithm. When this briefcase was used, making as many copies of the key as there were professors in the department was sufficient. Today, the security of digitally encrypted documents is a specialized area within computer science, represented at KIT by the Cryptography and Security working group in the Department of Informatics. *kn*

Briefcase with lock, key, and circulation list,
ca. 1910,
in use until 1949,
43.0 × 30.5 × 4.0 cm,
leather, metal, etc.
KIT Archives 28506/28.

↘ Alltag und kulturelles Leben

056 Learning Matrix for Automatic Character Recognition (1960)

The *learning matrix* was developed by the pioneer Karl Steinbuch (1917–2005) at the Institute of Computer Science by 1960. The device shown here is a demonstration model built at that time. The illuminated display could indicate characters, and the reading unit hung in front of it by hand registered them. By pressing a button, a link could be established between the displayed pattern and a character from the set of characters stored in the learning matrix. This linking process thus first required a decision by a human. Once linked, the character recognition set up in this manner could be reproduced by the system without further intervention. This was the innovative achievement of the learning matrix. By using the word "learning" in its name — a term generally associated specifically with human ability — the learning matrix not only garnered significant attention but also sparked concerns. Its development triggered discussions about the concept of Artificial Intelligence at Karlsruhe Polytechnic in the early 1960s, which term was in use already then. This partly controversial debate attracted not only engineers and scientists but also philosophers, who came to be known as the Karlsruhe School of Technical Philosophy.

The establishment of the Karlsruhe Department of Informatics in 1972 was largely based on the activities at the Institute of Communications Engineering and Communications Transmission under Steinbuch's directorship since 1958. Today, this institute exists at KIT under the name Institute of Information Processing Technology. Another key development strand leading to the KIT Department of Informatics began at the Institute of Applied Mathematics, which collaborated early on with the Nuclear Research Center and also founded the University's computing center. *kn*

Learning matrix for automatic
character recognition,
maker: Institute of Communications Engineering
and Communications Transmission,
two units each ca. 80 × 112 × 30 cm.
KIT, Institute of Information Processing
Technology (ITIV).

↘ Research; Innovation

↳ 100

How the Learning Matrix Works

The success of the early applications of the then-new electronic calculating machines sparked associations with human abilities and were often referred to as the "electronic brain." This notion provided a global impetus for research on biological nerve functions in combination with communications technology. How does human sensory perception work? It was already known that nerves transmit signals through electrical impulses and that the central nervous system, particularly the brain, contains an extensive number of links. This understanding prompted attempts to implement mechanisms in machines that could simulate biological functions.

Reflexes, especially conditioned reflexes as demonstrated by Pavlov, had long been recognized as simple bodily functions. Pavlov showed that the reflex of

"gastric acid secretion by food stimulus" could be triggered in dogs by the sound of a bell, even in the absence of food, if the sound had previously been associated with food multiple times. This suggested that dogs could "learn" such associations, implying that the higher nervous system in an animal organism could store such learned connections. Inspired by this model, Karl Steinbuch proposed an adaptive categorizer, which he called a "learning matrix." [174] This matrix consists of a grid of connection points where associations between rows and columns could be stored. The model shown here was built to illustrate this concept in its simplest form.

The core of this model is a relay matrix with 10 rows and 20 columns. A second panel device is used to generate input or display signals, referred to here as "events." These signals are actually entirely equivalent but they are arranged here in 5 rows with 4 columns each, so that this can represent the 5 capital and lower-case vowels of the alphabet using 20 points of light. A scanner with 20 corresponding photocells detects the light or dark status of each point, generating the column signals — i.e., either 1 or 0. During the so-called "learning phase," this scanner acts like an eye, feeding these signals into the learning matrix. When one of the 10 rows is selected as the "meaning" and a "learning step" is then performed, which means a memory signal is entered into the latching relays, the event pattern is linked to the selected meaning. This process can be repeated for all 10 event patterns.

In the so-called recall phase, it is assumed that the learning phase has been completed, consequently that all event patterns are stored correspondingly in the relay states. When an event pattern is presented again, the relays generate an output signal for each row, with the row that best matches the input pattern producing a maximum value. An extremum detection mechanism can identify this maximum value and output the corresponding meaning associated with the event input.

By appropriately configuring the extreme value detection, it is also possible to display patterns that contain minor errors corresponding to each event pattern. During the recall phase, events that are identical or most similar to those encountered in the learning phase are displayed. It is also feasible to display multiple similar meanings by modifying the row output accordingly. Conversely, by setting a high threshold, it is possible to prevent any row in the matrix from producing a sufficient sum signal, resulting in no meaning being displayed. This typically occurs when no learning step has yet been performed for a given event pattern.

This model essentially realizes an adjustable assignment between events and meanings, with the extreme value determination displaying this assignment. However, the learning matrix is directed rather than learning autonomously. Additionally, the coding of the events is a crucial aspect of the function. It quickly became clear that automatic character recognition is far more complex than a simple pixel-to-pattern assignment. While the term "learning matrix" is catchy and targeted, it was soon considered controversial, as it overstated the machine's capabilities, especially when it draws an association with biological organisms and their learning behaviors. Unfortunately, the expected results concerning the learning abilities of automated devices did not materialize. Nevertheless, Wolfgang Hilberg later demonstrated that the learning matrix was a misunderstood precursor to network structures, which today form the basis of artificial intelligence in the form of neural networks. Karl Steinbuch can therefore be regarded as one of the pioneers in this field. [175]

Winfried Görke

057 Core Memory (ca. 1965)

Core memory, with its grid-like structure, is a precursor to modern computer hard disks. In use from the mid-1950s for about 20 years, this storage medium employed ring-shaped ferrite cores suspended at the intersections of wires. These cores could be magnetized by a brief flow of current, making them suitable for information storage. By dividing the current directed to a specific ring to the two crossing wires, the individual storage units could be precisely controlled. Each ring could be either magnetized or demagnetized, representing a single bit of information. Characters were encoded using sequences of several bits, often 8, meaning that even a single letter required multiple memory cores. The intricate design of the core memory and visibility of the memory units to the naked eye make it clear that this was a complex and costly technology, offering relatively modest storage capacity compared to modern technology.

In 1965, a Zuse computer at the Institute of Applied Mathematics, at that time located in the architecture building of Karlsruhe Polytechnic, was upgraded with core memory. These memory units, recallable in less time compared to punched tape, were needed for information that was supposed to be particularly rapidly available in a running program. During the installation process, technicians placed the core memory units in the hallway of the architecture building. The sight of these grid elements apparently proved to be so intriguing to architecture students that several of the expensive components went missing. Fortunately, after several appeals, including an announcement in the cafeteria, all the missing components were fortunately returned. *kn*

Core memory unit of four matrices
each with 64 memory cores,
maker: Zuse KG/Neukirchen,
33.0 × 17.9 cm.
KIT, Scientific Computing Center.

↘ Research; Teaching and Academic Study

↩ 074; 076

058 Photo Album (from 1967 on)

This album, featuring photographs and additional clippings from printed material, documents Jürgen Schäfer's studies in geodesy at Karlsruhe Polytechnic from 1962 to 1967. Geodesy, or surveying, involves the scientific mapping of the world on both large and small scales, from measurements of the globe of the Earth, to defining property boundaries. As one of the oldest disciplines at KIT, geodesy traces its roots back to the engineering school established by Johann Gottfried Tulla in Karlsruhe in 1807.

Following Jürgen Schäfer's early death, his classmate Volker Schäfer compiled this album at the request of his widow. It highlights the strong practical component of the study program. Various basic surveying techniques were learned along with handling of the instruments in field exercises, some of which lasted several weeks. The Black Forest and Kaiserstuhl regions provided both scenic beauty and challenging terrain for these exercises. The photographic documentation captures the realities of geodesy work, which likely made geodesy particularly attractive to students: outdoor fieldwork in summer temperatures, spending the night in a tent or sleeping in a bunk bed, enjoying a break in the company of the professor, and social gatherings over beer. There is even an excursion to the North Sea to observe work on a survey ship. The album clearly conveys a nostalgic and positive view of past studies. *kn*

Photo album,
photographer unknown,
layout: Volker Schäfer,
25.0 × 30.5 × 2.5 cm.
Private collection.

↘ Teaching and Academic Study; Everyday Life and Culture; Call for Objects

↩ 002

Object proposal
I suggested this object to Dr. Anton Guhl who had published a notice in BNN 2021 requesting personal mementos of student days for an exhibition at KIT. Jürgen's college friend, Volker Schäfer, who is still alive, had compiled the album after Jürgen's death.

Christel Wessely,
widow of Jürgen Schäfer who died at 40 years of age

059 Theater Poster (1955)

In the post-World War II era, student life, previously dominated by National Socialist organizations, began to experience new freedoms. Starting in 1948, an amateur student theater emerged at Karlsruhe Polytechnic called Studio Stage (*Studiobühne*). This theater group performed contemporary plays, including works that, whilst known to only a few today, were considered novel at the time. One such play was *Fünf Mann – ein Brot* (Five Men – One Loaf) by Hermann Roßmann (1902–1985), a prisoner-of-war drama that was performed on many stages. In Karlsruhe, it was directed by Waldemar Leitgeb, an actor at the state theater who had a teaching assignment to train students in developing skills outside their formal curriculum. The performances provided a collaborative experience, allowing students to engage in a project from its inception through to its presentation in front of a Karlsruhe audience. This experience was particularly valuable, considering the frequently solitary nature of academic study. The rhetorical training provided by Leitgeb also had lasting benefits for some students in their later careers, such as Ernst-Ulrich Hiersche (1931–2015), who later became professor of road construction and railway engineering in Karlsruhe. Initially, the student theater was lambasted by the local press. In 1955, one critic even wrote: "One wouldn't even want to see the play [...] performed by professional actors anymore." ↗ 176 *kn*

Poster by Studiobühne at Karlsruhe Polytechnic,
83.5 × 59.0 cm.
KIT Archives 28008/10.

↘ Teaching and Academic Study; Everyday Life and Culture

The Nuclear Research Center and Karlsruhe Research Center (1956–2009)

060 Karlsruhe Nuclide Chart (as of 1958)

The Karlsruhe Nuclide Chart is a comprehensive classification scheme for the isotopes of all the natural and artificial elements. Isotopes are produced either in chain reactions, nuclear fission, or radioactive decay. The chart contains all experimentally known nuclides, their half-lives, decay types, and other data.

The radiochemist Walter Seelmann-Eggebert (1915–1988) and his coworker Gerda Pfennig (1930–2017) at Karlsruhe Nuclear Research Center developed the initial idea to present nuclides in a clear arrangement. The first edition was published in 1958, the same year that the Institute of Radiochemistry, headed by Seelmann-Eggebert, was established. The chart was an independently useful resource, irrespective of the Nuclear Research Center's objectives.

Over the decades, the chart has been continuously updated and expanded to reflect new scientific discoveries and to meet the needs of nuclear physics and nuclear medicine. In 2006, the rights and responsibilities related to it were transferred to the neighboring Joint Research Center (JRC) of the European Commission. The JRC has taken on the responsibility of ensuring that the Karlsruhe Nuclide Chart continue to exist as a globally recognized reference work and keep it up to date. *as*

Karlsruhe Nuclide Chart in a seminar room. KIT North Campus, building 101.

↘ Research; Call for Objects

Object proposal

At the Institute [of Radiochemistry], "radiochemical isotope courses" were offered, and the Karlsruhe Nuclide Chart was created in the context of this instruction […].

During renovations of the analytics building for radiochemistry (building 341), a nuclide chart in the form of a mosaic was installed in the common room, in remembrance of this important project.

I personally was employed in Dr. Mainka's Radiochemistry Analytics Group from 1982 to 1989.

Frank Geyer

Karlsruhe Nuclide Chart – Insights into Its History

After World War II, Germany was only permitted to work in the fields of nuclear technology and radioactivity again from 1955 on. There was great need for training in these rapidly developing research areas of nuclear physics, radiochemistry, and reactor technology. Professor Walter Seelmann-Eggebert was appointed director of the Institute of Radiochemistry, a part of the reactor construction and operating firm *Kernreaktor Bau- und Betriebsgesellschaft mbH*, founded in Karlsruhe in 1956, and he was called to the Chair for Radiochemistry at Karls-

ruhe Polytechnic. The institute offered "radiochemical isotope courses," and in the context of this instruction, the Karlsruhe Nuclide Chart was created in collaboration with Gerda Pfennig, which depicted the essential characteristics of the nuclides known at the time. It displayed, apart from half-lives and decay types, the energies of the emitted particles, and the most frequent gamma rays. The first edition of 1958 was in the form of a wall chart. Many thousand copies were made available to interested institutions also abroad. There was an additional edition on paper in standard DIN-A4 format for use at the desk. This first edition contained 1,517 nuclides of the 102 chemical elements known at that time.

High demand led to the publication of a second edition along with additional reprintings in the 1960s in collaboration with Professor Helmut Münzel and Gisela Zundel. The third edition in 1968 appeared as a result of the dissemination of the Nuclide Chart world wide with commentary in four languages (German, English, French, and Spanish). By 1998, three other revised editions had been published by scientists at Karlsruhe Research Center — Seelmann-Eggebert, Pfennig, Münzel, and the newcomer H. Klewe-Nebenius. Thus, within four decades, more than 150,000 wall charts and over 200,000 brochures with fold-out charts were printed.

In 2006, after the responsibility for the chart had been transferred to the Joint Research Center (JRC) of the European Commission, its seventh edition appeared, authored by J. Magill, G. Pfennig, and J. Gay, this time with commentaries in seven languages — Russian and Chinese in addition. A spin-off, *Nucleonica GmbH*, was founded on the basis of a license agreement in early 2011, which operates the online version of the Karlsruhe Nuclide Chart, now containing 4,122 experimentally confirmed nuclides of 118 chemical elements.

The Karlsruhe Nuclide Chart remains to this day the most popular interdisciplinary working tool, because it offers a quick overview of all nuclides and provides the user with their basic data. Its lasting relevance is demonstrated by the variety of its forms, ranging from the original poster and folded desk version, to large-scale rugs, ceramic tiling, and mural versions. This chart is very important in a wide assortment of scientific disciplines, from archeology — for instance, C–14 carbon dating —, to nuclear medicine and radio-pharmacy, to physics — especially astrophysics and cosmology.

Zsolt Sóti

061 Karlsruhe Standard Brick (ca. 1980)

Standard bricks made of hardened lead are used for radiation shielding, as they prevent high-energy radiation from penetrating through solid surfaces. These bricks are designed uniformly for assembly into modular walls and rooms tailored to specific needs. They have dovetailed edges to eliminate weak points or gaps at the connection joints, ensuring effective shielding. Lead bricks are among the most important structural radiation protection measures for constructing hot cells and shielded workplaces for handling highly radioactive materials. ↗[177]

In 1959, Karlsruhe Nuclear Research Center began purchasing lead bricks from external suppliers. As demand increased, the Center's main workshop was expanded in 1962 to include a melting furnace and a die-casting machine for in-house production of lead bricks. ↗[178] Initially, the lead bricks were produced according to the recommendations of the European Atomic Energy Community (Euratom). However, latest by 1967, the bricks were slightly modified to be compatible with Euratom types yet not strictly adhering to its recommendations. The term *"Karlsruher Normstein"* (Karlsruhe Standard Brick) became established for these lead bricks at the Nuclear Research Center. In 1974, the German Institute of Standardization published its first set of rules for these lead bricks. DIN 25407, *Shielding walls against ionizing radiation – Part 1*, defines the properties as well as the dimensions and shape of the bricks. The Center had presumably been involved in establishing the standard already at that time. The current version of DIN 25407 was drawn up by the Materials Testing Radiation Protection Equipment Standards Committee, in which KIT is a participant. *as*

Standard bricks for ionizing-radiation shielding,
20.0 × 20.0 × 5.0 cm,
hard lead.
KIT, Karlsruhe Research Accelerator KARA.

↘ Research; Innovation;
Call for Objects

Object proposal
This brick is a passive shielding aid that hardly needs improvement. The filed beveled edges interlock and prevent any direct seepage of radiation. They have been reliably shielding apparatus — whether small or large, weighing tons — in research and medicine for decades. These bricks are reusable and still comply with modern standards — also producible lead free according to the norm since 2011.

Hans-Christian Schneider

062 Radiation-Protection Slide Rule (1958)

This slide-rule model performs standard calculations in radiation protection. Special scales help find radiation quantities for different radioactive isotopes. For instance, the dosage through a substance is calculable from its volume, the distance to it, and the time. This instrument also allows one to calculate the drop in radioactivity over time on the basis of the different half-life values for each isotope, or the effect of a shielding as a function of the material, its thickness, and the radiation energy.

This slide rule was developed thanks to the state of the art in the technology at the beginning of the atomic age. A slide rule was an everyday object in science and engineering until the 1970s, when it was largely replaced by the electronic calculator. It permits multiplication and division of numbers, and calculations of squares and cube roots and, depending on the version, the computation of trigonometric or exponential functions. It operates on the logarithmic principle, by substituting complex multistep arithmetic operations by an addition. For instance, multiplication is achieved by aligning two series of numbers on the slide rule. The total length of these rows yields the result.

Its dimensions similar to a normal ruler allowed it to be carried about in a jacket pocket, like nowadays a smart phone. Portraits of individuals with slide rules from KIT's predecessor institutions reveal that this tool was seen as a positive symbol of their work and was often chosen to reflect their self-image. *kn*

Radiation-protection slide rule,
maker: Frieseke & Hoepfner GmbH
(model: Aristo 10174),
up to June 1958 (dating according to printing date of its instruction sheet),
33.8 × 5.6 × 1.0 cm (without sleeve),
plastic.
KIT, Institute of Applied Materials
(Mechanics of Materials and Interfaces, Fusion Materials Laboratory).

↘ Research; Call for Objects

Object proposal
The slide rule shows nicely that computations of dose-rates, shielding effect, or decay, now entrusted to powerful programs, are doable with a simple instrument, provided one can calculate the dimension in one's head. For 400 years, this graphic addition of logarithmic scales was an indispensable, handy tool for engineers and scientists — until the emergence of the pocket calculator.
Hans-Christian Schneider

063 Separating Nozzle for Uranium Enrichment (1969)

In 1955, physical chemist Erwin Willy Becker (1920–2011) developed a new method for separating the uranium isotope ^{235}U, which contains 235 neutrons, from the much more common isotope ^{238}U with 238 neutrons. ↗ 179 Due to its fissile properties, ^{235}U is valuable for the generation of energy and has applications in nuclear weapons as well. Becker's innovative idea suggesting the prospect of a new enrichment technology brought him to Karlsruhe Nuclear Research Center, where he directed the Institute of Nuclear Process Engineering until 1988.

The process Becker developed involves passing uranium, which is gaseous when combined with fluorine, through a millimeter-sized nozzle that curves tightly. In this process, the heavier ^{238}U atoms accumulate on the outer wall of the curve, while the lighter ^{235}U atoms concentrate on the inner wall. A peeler installed in the gas flow separates out the ^{235}U-enriched portions of the gas stream. This apparatus is known as a separating nozzle.

The separating nozzle technology was developed to industrial maturity at Karlsruhe Nuclear Research Center. Decades of collaborative development together with industrial partners aimed to make this technology viable for commercial use. A separating nozzle system made at the Nuclear Research Center was acquired by Brazil, but after it was installed, it never went into production.

One lasting benefit of the work at the Institute of Nuclear Process Engineering was the development of a method for producing very small and precisely crafted structures, which had been necessary for the nozzles. The institute's focus shifted entirely toward microstructure technology, after which it has been named since 1989. *kn*

Separating nozzle stage in the pilot plant of the Institute of Nuclear Process Engineering (IKVT) at Karlsruhe Nuclear Research Center,
photographer unknown,
November 18, 1969,
black-and-white negative.
KIT Archives 28028/01306

↘ Research; Innovation; Call for Objects

↩ 069

Object proposal
To me, the separating nozzle represents the transition from the Nuclear Research Center to KIT. The investigation on isotope separation, which, just like nuclear energy technology as a whole, ultimately led to a dead end, laid the foundation for microstructure engineering, which currently forms the basis of numerous forward-looking

developments in the areas of information technology, health care, and alternative sources of energy. It furthermore prepared the way for the very much smaller structures of nanotechnology.

Mathias Heckele,
KIT, Institute of Microstructure Technology

Object proposal
Humans were not the only ones to take care of law and order at that time, which I would like to remember here! The canine unit was an important component of the security services on the premises of Karlsruhe Nuclear Research Center (KfK). They were trained inside the KfK and added enormously to the security.

Emanuel Bronka

064 Canine Unit Pennant (ca. 1980)

In 1976, security measures at Karlsruhe Nuclear Research Center were significantly intensified in response to heightened protests against nuclear power and rising concerns about terrorist acts by the Red Army Faction. In addition to expanding fencing systems and intensifying access controls, the security staff was armed and supported by a canine unit.

The canine unit was responsible for patrolling the entire premises and particularly the nuclear facilities requiring special security, such as Research Reactor FR 2. Security personnel worked four shifts a day, with six dog handlers and their dogs assigned to each shift. Each handler had one dog, which they took care of on site. The animals were housed in kennels outside the center grounds near the south fence. The facility comprised 30 garages joined together by a corridor, with indoor and outdoor areas provided for the dogs.

Service-dog handling was trained by the police, with final examinations conducted by the head of training at the Nuclear Research Center. He also selected the dogs, only allowing the purchase of adult, trained animals. In 1988, the squadron expanded from 10 to 20 dogs. The handlers also participated in competitions, when pennants like the one shown here were used as souvenirs and for networking with other competitors. These pennants were also displayed in the canine unit staff rooms.

As the intensity of protests diminished, so did the perceived threat to the Nuclear Research Center. The canine unit was disbanded on December 1, 1994. *as*

Pennant of the canine unit at Karlsruhe Nuclear Research Center,
53.5 × 22.0 × 12.3 cm,
synthetic fabric and transparent film, wood and brass.
KIT Archives 28506/37.

↘ Everyday Life and Culture; Call for Objects

↩ 008

065 Fish Knife (ca. 1960)

The 20-centimeter-long fish knife from the cafeteria of Karlsruhe Nuclear Research Center bears the inscription “Kernreaktor Karlsruhe” on its handle. This stainless steel piece of cutlery dates from around 1960, when the Center was still officially known as *Kernreaktor Bau- und Betriebsgesellschaft mbH*. This lengthy name was often simplified in everyday use to terms like “Reactor Station” or “Nuclear Reactor.”

There are striking differences between this fish knife and the table knife from Karlsruhe Student Services, which is also displayed in this exhibition and is about three decades older. The pre-World War II student body was considered an elite social group and dined in the refectory using 25-cm-long, silver-plated table knives. The fish knife, by contrast, is of a size commonly found in modern cutlery sets.

The changeover from silver to stainless steel, points to the general acceptance of this material, especially in the cafeteria sector. Silver cutlery was also impractical to wash in such a large dining service with some 1,000 workers employed there. The knife’s simple and straightforward design suited contemporary aesthetic ideals. But this special stainless steel accessory also served as a status symbol. While many everyday objects from the Nuclear Research Center’s early years convey an impression of material modesty, this piece of cutlery — just as the occasional festive buffet held at the reactor cafeteria — reflected the Center’s elitist aspirations as a leading institution in national big science. *kn*

Fish knife,
maker: Württembergische Metallwarenfabrik AG (WMF)/Geislingen an der Steige,
19.8 × 2.0 × 0.2 cm,
nickel chromium steel 18/10.
KIT Archives 28506/29.

↘ Everyday Life and Culture; Call for Objects

↩ 039

Object proposal
Dining unites and encourages exchange. Traditions represent community and solidarity. The fish knife unites in both these ways, because it is the embodiment of the traditional Friday meal in the cafeteria on North Campus.

Christine Bender,
Head of the Financial Services Unit

Peter Faulhaber: Deutsches Brüter-Ende,
ca. 34 × 14 × 22 cm,
sculpture of stainless-steel tubing.
Private holding.

↘ Research; Innovation; Everyday Life and Culture

↩ 008; 029; 067; 072

066 Breeder Duck (1991)

This special duck is brooding in Peter Faulhaber's garden. It is crafted from high-quality stainless-steel piping once used to arrange nuclear fuel pellets geometrically inside a reactor fuel element. The sculpture bears the inscription "Deutsches Brüter Ende" — German Breeder End — a play on words rooted in the Baden dialect, which mutes the hard "t" in the word for "duck" — *Ente* — into a "d."

Peter Faulhaber had been employed at the Nuclear Research Center since the 1960s, with his work always closely tied to the fast-breeder reactor project. For many years, this reactor was seen as a beacon of hope because it was designed to generate most of its own fuel during operation — effectively "breeding" it. For decades, the Center conducted extensive research into how a fast-breeder reactor works and how it could be built and controlled. In 1972, based on the Center's findings, construction began on a fast breeder reactor in Kalkar on the Lower Rhine. Although the plant was completed in 1985, it never became operational. In the wake of the Chernobyl disaster in April 1986, political leaders at both the state level in North Rhine-Westphalia and the federal level decided to abandon the billion-dollar facility. This marked the end of the new breeder technology in Germany, including the reprocessing of nuclear fuels, despite the enormous investment put into its development. The fast breeder project at the Nuclear Research Center was shut down in 1989 and transferred into a new nuclear safety research initiative. The Center's breeder test reactor was permanently shut down in 1991.

For many of the Research Center's employees, the discontinuation of breeder technology represented a profound loss, effectively devaluing their lifework. The project's demise had to be personally and professionally reconciled. Near the end of his career, Peter Faulhaber was tasked with taking the superfluous materials used for breeder-fuel-element construction to a disposal company. From this company, he acquired a small quantity of the high-quality stainless-steel parts for his own use. With these materials, he created various technical solutions for his home and garden, including the brooding duck nestled in an honorary wreath of ivy. *kn*

067 Hydrogen Automobile (1986)

This VW bus was fitted with a hydrogen-powered electric engine for testing purposes in the Institute of Neutron Physics and Reactor Technology (INR) at the former Karlsruhe Nuclear Research Center. The vehicle underwent its trial run in 1986. The institute had developed the capability to handle hydrogen as part of its nuclear technology activities. This expertise allowed the institute to explore new technologies using hydrogen as an alternative energy source. Due to its high energy density, hydrogen was considered a potentially efficient fuel to achieve relatively long range travelling distances. In the initial phase, the energy contained in isolated hydrogen was converted into propulsion using an alkaline thin-film fuel cell. The INR itself tested the production of such units. In this hydrogen-powered vehicle, the electricity from the fuel cell drives an electric motor, serving as the drive unit. The hydrogen van, nicknamed *"Wasserstoffbulli,"* was approved for use on roads and was driven on what is now KIT's North Campus, even making appearances at the Hockenheimring motor racing circuit. The new technology has since been adapted for buses used in public transportation. A pilot operation preceding series production began in 2013 with a shuttle bus running between KIT's North and South Campuses. *kn*

Hydrogen-powered prototype vehicle
based on a VW T2,
built 1986,
17 kW (23 hp).
Technoseum/Landesmuseum für Technik und Arbeit in Mannheim.

↘ Research; Innovation

↩ 008; 029; 066; 072

Hydrogen as an Alternative Energy Source for Private Transport

When the Volkswagen van powered by hydrogen was in operation at the Nuclear Research Center, the automotive industry had just begun exploring this energy source for private vehicles. Eight years later, *Daimler-Benz AG* presented its first fuel-cell test vehicle, called Necar 1.

In principle, hydrogen can be used directly in conventional combustion engines, an approach that BMW experimented with. However, fuel-cell vehicles are always electrically operated. The electricity is generated by means of the exothermic reaction of hydrogen molecules with oxygen molecules. This process is emission-free, producing only water. Under optimal conditions, fuel-cell efficiency can approach 100 %.

Fuel cells for generating electrical energy were already ready for operation during the Karlsruhe trials, although not for road vehicles. In top-of-the-line space technology, fuel cells, along with solar panels and miniature nuclear reactors, were standard equipment. Adapting this technology for road vehicles presented additional challenges: storing and refueling highly volatile hydrogen, for instance, or adjusting power generation to varying operational demands, or developing cutting-edge technology for everyday use. Maintaining the working temperature of around 80 degrees Celsius — through initial heating and subsequent cooling during operation — posed one such challenge. In addition, the heavy hydrogen tanks needed to be kept in a deep-frozen state, which was energy-intensive and required too much space. These factors limited the practical usability of the VW Transporter, whose electric motor could only produce about 17 kW. A range of 500 km on a single hydrogen tank was achievable.

The Karlsruhe project was conceived during the oil crisis in 1973. But the Nuclear Research Center's primary motivation for venturing into vehicle propulsion was, to broaden the field of applications for nuclear reactors. High-temperature reactors produce substantial amounts of waste heat, which can be used to split water molecules into oxygen and hydrogen. This method is more direct and potentially more efficient than first generating electricity and then producing hydrogen through hydrolysis.

The State Museum of Technology and Labor in Mannheim (LTA) and Karlsruhe Nuclear Research Center had already collaborated in numerous instances, dating back to the museum's founding in the mid-1980s. When the Center decided to discontinue its experiments on motive power engineering, the museum's curator for mobility history accepted the offer to adopt the hydrogen automobile prototype. The vehicle was added to the LTA collection and has featured in various exhibitions, including ones focusing on innovative drive technologies.

Kurt Möser

068 Tissue Dispenser Box (ca. 1970)

Whilst almost unknown on KIT's South Campus, the green-and-white dispenser boxes filled with disposable wipes have become an integral part of the North Campus. These tissue boxes have been a part of daily life for employees since the early years of the Nuclear Research Center. Institutes and other organizational units can easily obtain them from the central warehouse, but their ubiquity is not solely due to their easy availability.

Such lint-free wipes are needed in laboratories for all sorts of cleaning purposes. They were also utilized to temporarily secure sample materials during transport via pneumatic tube. The practical design of the dispenser even permits their use with gloves in a shielded experimental box, making this form of dispensing essential in such environments. The dispenser boxes appear in many laboratory photographs and other images show that they were used in offices, as well.

These tissue dispensers, with approximately 250 per box with an opening at the top, exist since 1924. The American company Kimberly-Clark initially marketed the tissues for facial care, later promoting them for use when down with a cold. Today, the boxes are available in various models, including a special product line designed for laboratory use. The range of manufacturers has also expanded.

The dispenser box was included in this exhibition because it is frequently mentioned by staff as an everyday object that sets the work environments between KIT's North and South Campuses apart. Whether this differentiation indicates a certain mentality about what is important is debatable. Perhaps the attention given to this everyday item stems from a desire for individuality within KIT's large-scale organisational body. *as, kn*

Tissue dispenser box,
ca. 1970,
24.8 × 11.4 × 5.3 cm,
paper and cardboard.
KIT Archives 28506/33.

↘ Everyday Life and Culture; Call for Objects

Object proposal

The Kleenex box immediately occurred to me as a relevant object because, as a long-standing employee on KIT's North Campus, I became acquainted with this Kleenex box from my very first day and saw it variously in use everywhere.

Anja Weindel

Outcome of a Quest for Meaning

As a collaborator in the KIT bicentennial exhibition, I'd like to share a few impressions and experiences from my research on the tissue paper. No matter where my research took me or which departments I visited, and employees I spoke to, I always received a response, a smile, and much praise for the many uses of this article. After years of relying on them, nobody seemed willing to do without these "cosmetic tissues."

I started my inquiry in the photo department, where as soon as I entered the room I spied such a box prominently displayed on the conference table. The tissues have been used here for many years to clean lenses, many other camera parts, and, of course, to wipe noses. Markus Breig, who has headed the photo center for many years, recalled having once photographed the box for a calendar featuring images of everyday objects at the Research Center, and gave me a copy of this prop-up calendar, which includes that photo of the box.

Another visit took me to the print shop, where I interviewed a long-time North Campus employee, Ilona Metz. The box was also standing visibly on her table. She confirmed that the tissues were primarily entrusted with wiping away all sorts of things. I conducted similar interviews with our colleagues from different administrative departments. Whether used as a handkerchief, a makeup remover, or a quick solution to wipe up spilled coffee, juice, or other liquids, the tissue box was the rapid response. One's glasses and monitor screen were also wiped clean with them, of course.

A long-time employee of the Institute of Applied Materials confirmed to me that they had even been used in research settings. He recalled instances where the tissue dispenser was even positioned inside a shielded test cell for access by a remote-controlled manipulator arm. Thus, it was possible to wipe away, cushion, clean or dab up materials even in a laboratory handling radioactive substances.

In the course of my research, I heard many stories and reminiscences related to that tissue box and many of those anecdotes, ranging from practical to amusing, offer glimpses into the daily routine and research activities at the former Research Center.

Anja Weindel

069 "Henry the Ant" with His Gearwheel (1986)

The ant with the micro-gearwheel, affectionately named *Henry*, has long served as the iconic motif of the Institute of Microstructure Technology (IMT) at KIT. Gerhard Schüler, who worked at the institute, created this electron microscope image to visually represent the minute scale of the gearwheel by comparing it to an ant.

The institute had developed the capability to manufacture such high-precision micro-components while working on an uranium enrichment method that required the mass production of millimeter-sized nozzles. At that time, it was known as the Institute of Nuclear Process Engineering and had to develop its own manufacturing method to meet the process's demands.

After the discontinuation of research on uranium enrichment, the institute shifted its focus entirely to microfabrication processes, partly because there was potential to transfer its innovations to industry. In 1989, it was renamed the Institute of Microstructure Technology.

The micro-manufacturing process developed at the institute has since been applied in various fields, such as the production of components for microsurgical and dental devices and gears for high-quality watches. Microworks, a company founded as a spin-off of IMT, acquired a manufacturing license for this technology. Since then, micro-manufacturing techniques have continued to evolve. Today, the institute's primary focus is on 3–D nanoprinting. *kn*

Micro-gearwheel, nickel, diameter:
0.26 mm, scaled against the size of an ant,
photographer: Gerhard Schüler,
3.6 × 2.4 cm
black-and-white negative.
KIT Archives 28028/19225..

↘ Research; Innovation;
Call for Objects

↩ 063

Object proposal

The micro-gearwheel symbolically stands for the conquest of biological dimensions by engineering. The first step toward the dream of a submarine navigating the human circulatory system.

Mathias Heckele,
KIT, Institute of Microstructure Technology

Application of the LIGA Process in the Construction of Microcomponents

The trend toward miniaturization has been ongoing since the early days of semiconductor technology. By the late 1980s, many believed that the shorter wavelengths of X-ray light were vital in the manufacture of tiny structures. This hypothesis, coupled with the need to manufacture separation nozzles with small radii of curvature, led to the development of the LIGA process at the Institute of Nuclear Process Engineering. LIGA is an acronym for "*Lithografie, Galvanik, und Abformung*" and involves using X-rays from a synchrotron for lithography, electroplating to fill the resulting polymer structures, and mold casting to replicate these structures, in order to be able to produce inexpensive products with intricately crafted tools.

The coupling of lithography and electroplating is a very common production method, such as for printed circuit boards. However, the LIGA process's combination of X-ray lithography, electroplating, and molding is a specialty of *Microworks GmbH*, a spinoff from the Institute of Microstructure Technology. Components produced using this technique often feature tall, narrow structures, typically fabricated 10 to 20 times taller than their width — sometimes even up to 50 or 100 times taller — with line widths as small as 0.5 µm. Sloped structures on a substrate are also typical for this process.

The Microworks company was founded in 2007 following a successful sponsored project that developed precision parts for Swiss watches — a market that continues to require the X-ray-based LIGA process.

Another application of this technology is the gearwheel attached to *Henry's* feeler. The smallest play-free gears currently available on the market are made of such components.

Proximity to KIT and ongoing collaboration with its institutes are essential to ongoing research at Microworks and thus the transfer of LIGA technology to commercial applications. The Zeiss Innovation Hub@KIT, now located not far away, grants its employees quick access by e-scooter to the synchrotron radiation source on KIT's North Campus, to take X-ray lithographic exposures. Access to facilities at the Institute of Microstructure Technology on a pay-per-use basis is also important, for instance, to quickly produce the masks needed for t he LIGA process.

Joachim Schulz (†)

070 The Tension Triangle as a Bionic Stabilization Principle (2005)

The founding charter of Karlsruhe Polytechnical College in 1825 states the aim of the new institution as being to convey knowledge, in order to "generate the largest effects by the smallest means." This principle is an underlying motivation in the engineering sciences, now mostly pursued with mathematics, computers, and rigorous experiments at testing stations. Claus Mattheck, during his tenure at KIT's Institute of Materials Science II from 1980 to 2012, followed an alternate research path in bionics. By studying trees and other living organisms and inanimate natural structures, he gleaned insights into optimization. Mattheck identified one crucial principle: the omnipresence of tension triangles in the stabilization of notches. Unlike conventional engineering practices of reinforcing right-angled joints with quarter circles set at angles, Mattheck recognized that there is a better design in nature: tension triangles. These structures, pervasive in organic growth, provide robustness and efficiency. Mattheck's result, derived from observing nature, is easy to implement because a simple triangular-shaped protractor (a *Geodreieck*) is all you need to construct with tension triangles. Mattheck's insights inspired the drafting of engineering guidelines issued by the Association of German Engineers (VDI). By 2016, his principles were codified as the standard DIN ISO 18459 *"Bionics – Bionic Structural Optimization."* His research group's publications, translated into numerous languages including Korean and Japanese, underscore the global impact of his work. *kn*

Claus Mattheck:
The Method of Tension Triangles,
hand drawing,
digital photo.
KIT Archives 28010/I 6480.

↘ Research; Innovation

071 Trainer for Minimally Invasive Surgery (ca. 2003)

This device for practicing minimally invasive surgery (MIS) techniques was developed at Karlsruhe Research Center. Since the 1980s, MIS has become an established practice in surgery, offering patients significant advantages, such as reduced pain and faster recovery times. However, this technique presented challenges for surgeons, including a limited viewing field and restricted freedom of movement. Handling the instruments also proved to be more difficult.

To support the specialized training required for this procedure, the first Karlsruhe MIS trainer was created at Karlsruhe Research Center in the 1990s. Its "input device," with sensor-based precision mechanics, was developed by the Institute of Applied Informatics in the Center's central training workshop. In the ensuing years, the device was enhanced to improve the real-time simulation of elastic tissue. Force feedback was also added to simulate the resistance encountered in the operated area, providing a more realistic training experience. Through a technology transfer project, the trainer could be developed further into practical products. Various training devices for neurosurgery and arthroscopy, for instance, were created in collaboration with medical professionals from different specialties. Research on the trainer continued until the early 2010s.

The trainer was regularly used to train aspiring medical practitioners. During courses, they could practice handling the necessary instruments for MIS procedures. For example, they learned how to perform minimally invasive gall bladder removal using this device. *as*

Virtual Reality Force Feedback Simulator for minimally invasive surgery,
ca. 125 × 75 × 100 cm (compact).
KIT, Institute for Automation and Applied Informatics.

↘ Research; Teaching and Academic Study; Innovation; Call for Objects

Object proposal

The research and development of the trainer was an innovation at the cutting edge of the international research landscape. It was regularly displayed as an effective advertiser of Karlsruhe Research Center, conducive to the media at home and abroad. For many years, demonstrations were also held on the Open Days, always delighting enthusiastic visitors.

Heiko Maaß,
KIT, Institute for Automation and Applied Informatics

072 Superconducting Magnetic Coil for Nuclear Fusion (2000)

The fusion of hydrogen nuclei releases a significant amount of energy. The experimental reactor ITER (International Thermonuclear Experimental Reactor), currently under construction in France through international collaboration, aims to develop the technological foundation for a fusion power plant by 2035. A central component of ITER's design are the kidney-shaped electromagnetic coils, each approximately 7 meters in height, as illustrated here. These coils are arranged in a ring inside the fusion reactor, enclosing the space that contains the fuel needed for fusion. Magnetic coils are essential because nuclear fusion occurs at temperatures of several hundred million degrees Celsius. This process is only manageable if the fusion fuel mixture is kept suspended without touching the reactor walls. This is achieved by generating a magnetic field of 10 Tesla — equivalent to the weight of the Eiffel Tower. Creating such a strong magnetic field requires an electrical current of 80,000 amperes, a level that would instantly destroy ordinary copper wires. This problem is overcome by constructing the magnetic coils out of superconducting niobium-tin (Nb_3Sn). When cooled below –255.15 °C, electrical resistance in this material is nearly eliminated, allowing the conductor to withstand the immense current needed to generate the magnetic field. These magnetic coils are produced industrially. To test them, the Institute of Technical Physics at Karlsruhe Research Center developed the Toroidal Coil Test Assembly Karlsruhe. This development was based on decades of research into superconducting materials at the Center. *kn*

Magnetic coil,
maker: AGAN Consortium
(ACCEL Instruments, Alstom, Ansaldo, Babcock Noell Nuclear, Europa Metalli),
ca. 4.1 × 2.3 × 6.7 m.
KIT North Campus, corner of Eggensteiner Straße/Blankenlocher Straße.

↘ Research; Innovation

↩ 008; 029; 036; 067

073 MIPAS Spectrometer
(2002)

The MIPAS (*M*ichelson *I*nterferometer for *P*assive *A*tmospheric *S*ounding) Fourier spectrometer was one of ten measuring instruments aboard the European Space Agency's (ESA) ENVISAT (Environment Satellite) Earth observation satellite. It detected minimal gas concentrations globally, day and night, in the stratosphere and cloud-free troposphere, that is, at altitudes of 5 to 150 kilometers above the Earth's surface. From 2002 to 2012, MIPAS gathered data used by thousands of scientists worldwide to study climate change and global warming. Both MIPAS and ENVISAT remain in Earth's orbit. The model displayed here is a 1:1 scale replica.

The spectrometer was developed at the Institute of Meteorology and Climate Research of Karlsruhe Research Center and Karlsruhe University. It was initiated by Professor Herbert Fischer in 1988 when Fischer proposed to ESA the use of a cooled Fourier spectrometer on an environmental research satellite. Prior to its integration into ENVISAT, variations of this spectrometer technology were employed on the ground, in aircraft, and borne by high-altitude research balloons. *as*

Michelson Interferometer for Passive Atmospheric Sounding from space,
developed by: Institute of Meteorology and Climate Research at Karlsruhe Research Center and Karlsruhe University,
operation in space of one exemplar 2002–2012,
175 × 180 × 70 cm (with transportation frame).
Deutsches Museum, Munich.

↘ Research

↩ 007

Karlsruhe University (1967–2009)

074 Karlsruhe Student Uprising (1970)

Unlike other campus sites, at Karlsruhe University the years following 1968 were relatively quiet. Demonstrations, such as the one shown here, were infrequent. Nevertheless, there were instances of student discontent directed at professors. Global political issues, such as the Vietnam War, were the subject of discussion in handout leaflets. The volatile atmosphere at the university is also evident from the rector's decision to instruct professors not to wear their academic robes during the annual academic festivities.

One notable highpoint for the student movement was the occupation of the university computing center in 1970, which included a demonstration march through Karlsruhe's city center. However, closer examination reveals that these actions were not aimed against the university or its administration. They were rather a concerted strategic move borrowing methods of protest employed elsewhere to articulate specific academic grievances to the state government. The protesters were concerned about the quality of computer science education. They criticized the capacity of the computing center, which they felt was inadequate. Students demanded more computing time and complained about having to use outdated machines "predating the Biblical flood." /180 During the three-day occupation, only students had access to the university computing facilities, complete with admission controls and passes for the student security force. The management of the computing center not only viewed this activism kindly, they had indeed instigated it as part of a public relations effort to support plans for purchasing a new mainframe computer. /181 The initiative proved entirely successful: By mid-year, the university was able to sign a contract for the delivery of a UNIVAC 1108 computer for the considerable sum of 21 million deutschmarks. /182 *kn*

Demonstration procession of students on Karlsruhe's Kaiserstraße,
photographer unknown,
January 20, 1970.
Digital copy of a black-and-white print.
KIT Archives 28010/I 8131.

↘ Teaching and Academic Study; Everyday Life and Culture

↩ 015; 030

075 Self-Launching Glider (1971)

In 1971, the AK–1 glider, developed by the *Akademische Fliegergruppe (Akaflieg)* at Karlsruhe University completed its maiden flight. This innovative design featured a retractable auxiliary engine for self-launching, which influenced the development of motorized gliders with retractable engines. The auxiliary engine also helped bridge thermal lulls and reduce the risk of irregular landings. This first flight marked the culmination of over 15 years of design and construction work by students at Karlsruhe Polytechnic (redesignated a university in 1967). The necessary expertise converged on Akaflieg because students could apply their theoretical knowledge there practically. Scientific support from the academic institutes, along with access to workshops and laboratories for component testing, was similarly crucial to the project's success. The AK–1 remained in flight service until 2008 and is now exhibited as a technical monument at *Deutsches Museum* in Munich.

Akaflieg Karlsruhe, like other academic flying clubs in Germany, was established in the 1920s. Like other academic sports, one initial motivation for its creation was the ban imposed by the Treaty of Versailles on military pilot training, which led to flying activities at universities in an attempt to replace it. During the Nazi era, Akaflieg was dissolved, and aviation activities were absorbed by a Nazi mass organization. In 1951, Akaflieg was reestablished as an association independent of any externally set aims. The AK–1 marked the beginning of a series of projects for Akaflieg in Karlsruhe. Currently, their most ambitious undertaking is the development of a tailless glider, anticipated to give a further innovative boost to glider design. *kn*

Glider AK–1,
maker: Akademische Fliegergruppe Karlsruhe, Karlsruhe,
maiden flight 1971,
wingspan 15.0 m,
empty weight 300 kg,
propulsion: four-cylinder two-stroke engine Hirth F 10 A1a with 19 kW (26 hp).
Deutsches Museum,
Flugwerft Schleißheim.

↘ Teaching and Academic Study; Innovation; Call for Objects

↩ 040

Object proposal

The AK–1 glider was the starter's gun for a whole line of successful research projects. The innovative idea of a retractable engine was an important impetus for the very successful modern hinged-power-unit technology in glider design. Thus, Karlsruhe Akaflieg could write aeronautical history, particularly with the AK–1 as well as with other projects from that time. Due to its historical importance, the AK–1 model is on display at Deutsches Museum in Munich since 2011.

Mikail Albayrak,
first chairman of Akademische Fliegergruppe at Karlsruhe Institute of Technology e.V.

On the Development of Akaflieg AK–1

As early as 1955, Akaflieg Karlsruhe began to develop motorized gliders with good gliding performance. They recognized the significant advantages of self-launch capability, which not only extended the glider's range but also reduced the need for ground personnel, minimized the risk of landings off the airstrip, and simplified transport logistics. The main problem posed by motorized glider construction is integrating an engine into a glider without significantly compromising the glider's performance and flight characteristics.

In addition to an increase in overall weight, the primary reason for performance degradation due to the engine is aerodynamic. A permanently installed drive unit creates significant air resistance when not in use.

A more effective solution was the retractable driving gear, which complicated the design enormously. In 1965, all was finally ready: the preliminary research commissions to investigate tow ropes, winch launches, and the building of a customized launch winch were completed. The Hirth F10 was finally available as a functional drive unit, allowing the design of a motor glider to begin, with the following objectives:

- Self-launching capability without auxiliary personnel,
- State-of-the-art gliding performance,
- Minimal maintenance and overhaul requirements,
- Weather-resistant construction and materials.

The AK–1 took to the skies for the first time on January 9, 1971. On July 7, 1973, it was named Mischl (mutt) by the professor of meteorology, Max Diem, reflecting its hybrid character as both a powered aircraft and a glider.

After completing flight tests, it received certification from the Federal Aviation Office and was used by all Akaflieg pilots holding a motor glider license. Its performance met the design targets established in the 1960s. Nowadays it is no longer suitable as a competition aircraft. The proliferation of motor gliders with retractable engines since the 1980s testifies to the merits of the AK-1 design developed in the early 1960s.

Mikail Albayrak

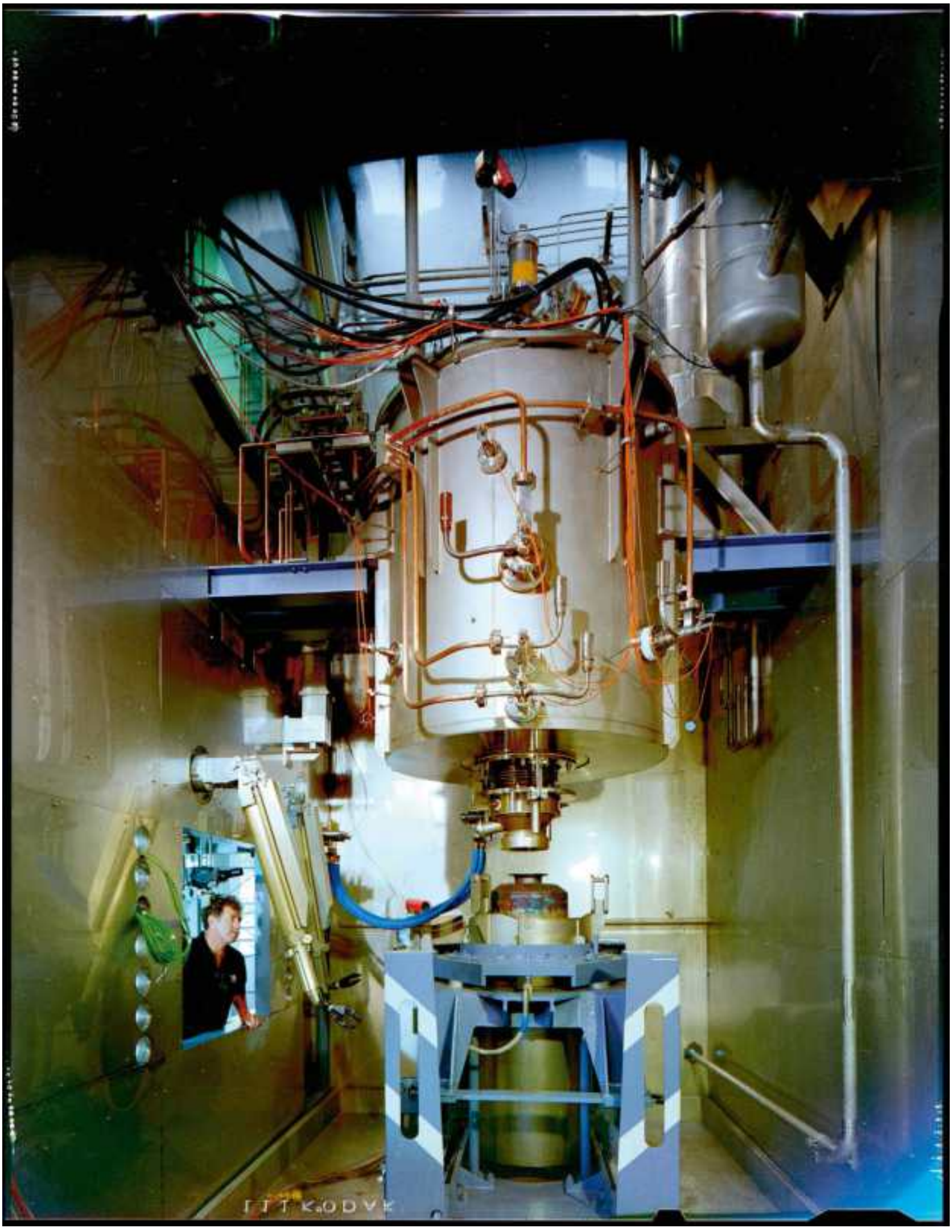
089 Mold for Radioactive Waste ca. 2000

→ p.313
↩ 008



089 Mold for Radioactive Waste ca. 2000

→ p.313
↩ 008

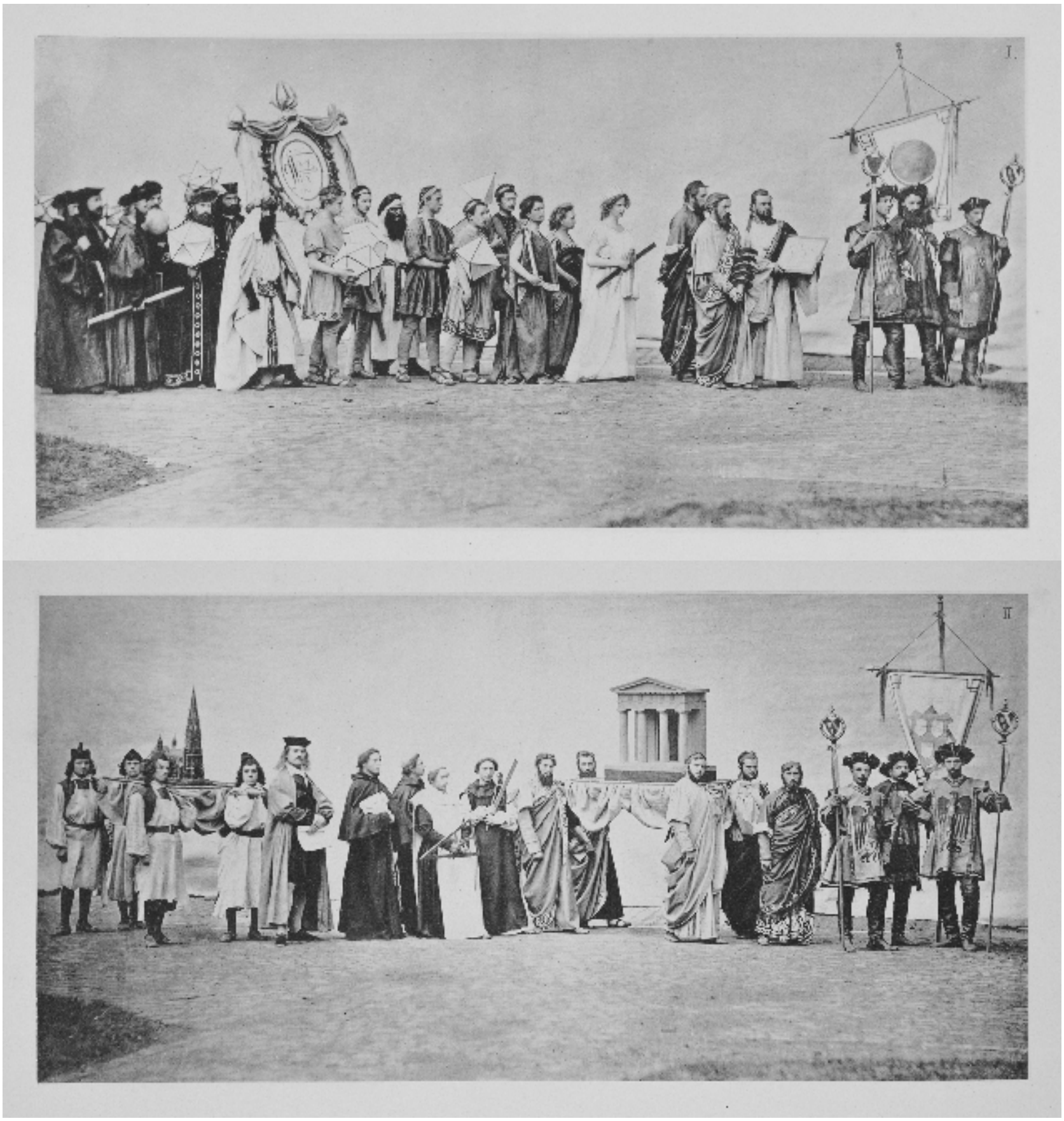



cement

091 Monument to the Fallen Polytechnicians in the Franco-Prussian War of 1870/71 1873

→ p.315
↳ 093




I.
II

Polytechnicians’ Pageant 1877



→ p.316



093 Pallas Athena 1925

→ p.316
↩ 091
↳ 098; 099



094

Plaque in Memory of Gas Chemist Hans Bunte 1932

→ p.317
↩ 029



095 Memorial Plaque on the Development of Ammonia Synthesis 1990



→ p.317
↩ 033; 036
↪ 096



Plaque in Protest of Chemical Weapons 1991

→ p.318
↩ 033; 036; 095



097 Plaque on
Research Reactor FR 2 ca. 1995

→ p.318
↩ 008



Carl Benz Monument 2007

→ p.319
↩ 018; 019; 093



099 Memorial Plaque Dedicated to the Victims of National Socialism 2016

→ p.319
↩ 093



Januar 2022, Nr. 1

Die Klolektüre

Jetzt auch online!

Scheiß auf **Karl Steinbuch**



Das Steinbuch Centre for Computing (SCC) ist vermutlich allen Studierenden des KIT ein Begriff, doch wer war der Mann, nachdem nicht nur das Rechenzentrum des KIT sondern auch das Karl-Steinbuch-Stipendium benannt ist und der die Verdienstmedaille des Landes Baden-Württemberg trägt?

SS-Mitgliedschaft und Kriegsverbrechen

Neben seinen Errungenschaften für die Informatik, mit denen diese Ehrungen wohl begründet werden, zeichnet sich schnell das Bild eines überzeugten Nazis. Dies beginnt mit dem Beitritt in die HJ im Jahr 1933. Von dort aus tritt er der SS bei und steigt zum Rottenführer auf. Später tritt er auch der NSDAP bei. Während des Krieges schreibt er in sein Tagebuch Sätze wie **"Russen sind wie ihr Ungeziefer"** und beschreibt wie er Kriegsverbrechen beging, indem er im Juni 1942 befahl eine Kriegsgefangene zu erschießen.

Nachkriegszeit

Noch während des Krieges studiert Steinbuch Physik. 1958 tritt er eine Professur an der TH Karlsruhe an. Trotz der vermeintlichen Entnazifizierung, die auch Steinbuch in Form eines Spruchkammerverfahrens durchlief, begann er parallel zunächst mit der SPD eine politische Karriere. Nach einem öffentlichen Disput mit Willy Brandt nähert er sich zunächst der CDU an und zeigt in der Folge wieder seine rechte Gesinnung.

Rechtsextremer Autor

Es folgte eine weitere Radikalisierung nach rechts und er schrieb Anfang der 1980er davon, dass **"die biologische Substanz unseres Volkes"** durch eine angebliche **"Überfremdung"** vertan werde. Fremdenfeindlichkeit sah er als **"natürliche Abwehrreaktion"**. Der damalige Bundespräsident von Weizäcker hätte laut Steinbuch durch den Satz "Nicht Ausländer raus, sondern Ausländer rein" seinen Amtseid verletzt. Er bestritt außerdem, dass Wehrmachtssoldaten von NS-Verbrechen wussten oder an ihnen beteiligt waren. Protest gegen Rassismus in der deutschen Mehrheitsgesellschaft nach den Anschlägen von Hoyerswerda 1992 bezeichnete Steinbuch als **"verlogenes Geschrei"** - den Tätern in Hoyerswerda bliebe **"nichts als Gewalt"** übrig. Von ihm stammen außerdem Aussagen wie **"Ohne die Barbarei des Versailler Vertrages hätte es Hitlers Barbarei wohl nicht gegeben"** und die **"Gleichberechtigung der Frau in Politik und Wirtschaft"** würde sie **"ihren Kindern entziehen"**. Auch schreibt er 1992, dass sein **"Herz noch immer bei der deutschen Wehrmacht"** sei. Ab 1992 wandte er sich auch der rechtsextremen Kleinpartei "Die Republikaner" zu, indem er die Partei bewarb und für deren Parteizeitung schrieb.

Die Benennung des Rechenzentrums nach Steinbuch erfolgte im Jahr 2008 in vollem Wissen um Steinbuchs Verbrechen und seiner nationalsozialistischen Gesinnung. Weiter ehrt die Fakultät für Informatik Steinbuch mit einer Gedenktafel, auf der seine rechten Gedanken nicht nur keine Erwähnung finden, sondern er explizit für das frühe Erkennen "demographischer Probleme" gelobt wird.

Wir fordern die Umbenennung aller nach Nazis benannten Einrichtungen und eine kritische Auseinandersetzung mit den namensgebenden Persönlichkeiten.

Die Klolektüren erscheinen immer zu Beginn des Monats. Gerne könnt ihr die Klolektüren auf euren Lieblingstoiletten aufhängen. Die gedruckten Seiten liegen im Chemiegebäude des KIT auf den Tischen aus.

✉ Klolektuere@riseup.net

076 First German Computer Science Diploma (1971)

The certificate displayed here, dated January 20, 1971, represents Germany's first *Diplom-Informatiker* degree earned in computer science. It marks the inception of a highly sought-after course of study that continues to shape KIT's profile to this day. This start was not the "big bang" of the discipline, though. As in Karlsruhe, other universities had already offered ways to specialize in the field in the 1950s, following courses of study in mathematics and electrical engineering. The true novelty about the academic degree awarded in 1971 was its name. The term "informatics," chosen in 1968 by the Federal Ministry of Science and the German Research Association, was virtually the cornerstone of the new discipline of Informatics established in the 1960s. ↗ 183

The Institute of Applied Mathematics at Karlsruhe Polytechnic began training students in data processing in 1958. Before its own computers were acquired, programming lessons were conducted using a Zuse Z 22 at the Nuclear Research Center. Almost at the same time, a data technology course was offered in electrical engineering at the then-named Institute of Communications Engineering and Communications Transmission, now known as the Institute of Information Processing Technology (ITIV). The computer science pioneer Karl Steinbuch (1917–2005) had been appointed in 1958 as its director. While Steinbuch's teaching was clearly focused on hardware, the Institute of Applied Mathematics concentrated primarily on programming. In early 1969, Karl Nickel (1924–2009) founded the Institute of Informatics and launched the computer science *Diplom* degree program, paving the way for software-oriented computer science education at Karlsruhe University. *kn*

Diploma by Karlsruhe University for
Jochen Dietrich,
January 20, 1971.
KIT Archives 21015/7314.

↘ Teaching and Academic Study; Call for Objects; Milestones in KIT's History

↩ 057; 087

Object proposal
The justification for my proposal is "self-explanatory": Germany's first certified informatics graduate (*Diplom-Informatiker*).
Jochen Dietrich

077 Noose (1979)

In 1979, the student representatives in the Grand Senate at Karlsruhe University pulled a grim joke on a member of the university's administration using the object shown here. This provocation was triggered by the 1977 state law abolishing General Student Councils (AStA) as separate official boards at Baden-Württemberg's universities. This resolution by the Filbinger administration was motivated by concerns that left-wing student councils were political activists and perhaps supported the terrorist group Red Army Faction.

According to the new law, the Committee "for the Promotion of Social, Intellectual, Artistic, and Sporting Interests" of Students, in the Grand Senate, was the only remaining official student representation. The funds and assets of the abolished AStA had to be handed over to the university. The members of the reorganized "Senate's AStA" took this as an opportunity for protest. They sent a letter to the employee responsible for the university inventory with a hangman's rope knotted into a noose as AStA's supposed official assets. The dating of the cover letter, according to a new era starting with the abolition of the constituted student government, underscores the degree of their discontent. The fact that the senders concealed their — otherwise known — identities by using a fingerprint as a signature perhaps indicates their awareness that sending such a noose was transgressing a boundary of acceptable behavior.

The recipient of the letter responded with remarkable composure, mirroring the anonymous hide-and-seek approach by using copied fingerprints in the recipient address line and salutation, and likewise signing with his own fingerprint. The substance of this reply also proved him impervious to provocation by consistently staying within the realm of light humor.

In 2012, thirty-five years after this intervention by the government, legislation was passed allowing the reintroduction of constituted student governments as organs of Baden-Württemberg's state universities. Today, the General Student Council at KIT upholds the memory of the interim period, during which the Independent Student Council (UStA) existed outside of statutory university structures. ↗ 184 *kn*

Rope with a hangman's knot and
inventory label of Karlsruhe University,
2 letters, (1979).
KIT Archives 28506/17.

↘ Everyday Life and Culture; Milestones in KIT's History

078 First Email Received in Germany According to the Internet Protocol (1984)

The text printed here marked the beginning of email correspondence at the Informatics Division (*Informatik-Rechner-Abteilung*, IRA) of the Karlsruhe Department of Informatics in 1984, using the technical protocols that would later become standard on the Internet. At that time, experienced computer scientists did not immediately recognize the historical significance of this development. They had been sending personal messages via a computer network designed for data packet transmission for over a decade already. The widespread adoption of email across various domains did not occur until 1991, with the introduction of the hypertext-based World Wide Web and the subsequent establishment of browsers with graphical user interfaces. These advancements were what made email a universal communication tool.

The email received by Michael Rotert at IRA on August 3, 1984, from the operators of the US Computer Science Network (CSNet) was a milestone in itself, because it simplified computer-based communications between research institutions across the Atlantic. Werner Zorn, professor of informatics at Karlsruhe University and head of IRA, had been advocating for a connection between the emerging German research network and CSNet since 1982. Another significant achievement by IRA was the first connection of a Chinese computer to an international network in 1987, which laid the groundwork for the development of the Internet in China.

The expertise imparted by the university's Internet pioneers caused a significant boost in development for the city of Karlsruhe. The arrival of numerous Internet companies and network services led to the city being awarded the title: "Internet Capital" by a business magazine in 2003. ↗ 185 One of the first German Internet providers, XLINK, was established here in 1989 which had begun as a university research project. *kn*

Email,
August 2, 1984,
provenance: Karlsruhe University.
Stadtarchiv Karlsruhe 8 Sts 4 265.

↘ Research; Innovation;
Call for Objects; Meilensteine
der KIT-Geschichte

Object proposal
The fact that Germany's first email was received at what is KIT today, represents in my view not only research ambition and openness to novelty, but also scientific exchange and international networking — and thus things that I personally also relate to KIT and its members.

Ferdinand Leikam,
Leiter der Historischen Museen der Stadt Karlsruhe

Eye-witness Report
The first German email server on today's Internet resulted from a project aiming to enable the German Research Network (DFN) to establish connections to international networks. Professor Werner Zorn was the project manager.

I was hired by Professor Zorn in 1983 to operate new computers. These machines were equipped with the UNIX operating system, which was delivered in source code and could be customized to meet the needs of the computer science department. UNIX already included Internet protocols such as SMTP, FTP, TCP/IP, etc., which had been introduced as the standard on the ARPAnet (now the Internet) on January 1, 1983. This system formed the basis of the DFN project. The ARPAnet, which had emerged from a military research project, also included the entire MILnet, the network of the US Department of Defense. Although MILnet was separated from the ARPAnet for security reasons in 1983, the United States remained reluctant to connect non-US institutions directly to the ARPAnet. The main concerns were related to espionage from behind the Iron Curtain.

To enable global communication for research and science, a project called CSNet (Computer Science Network) was established. CSNet primarily offered an extended mail service but was also directly connected to the ARPAnet. One of CSNet's goals was to link research institutions in countries outside the United States, with one access point per country. The project was intended to be self-supporting after its expiration. Via CSNet, it was possible to initiate email-controlled file transfers of documents also from the ARPAnet.

In March 1984, I contacted the CSNet operators via the existing email account of Professor Gerhard Goos, who had been working in the Department of Informatics at Karlsruhe University since 1970. In early July 1984, I received the UNIX software necessary to establish a connection and operate an email server on CSNet.

On August 3, 1984, I received "the first email" via this connection, confirming my announcement that the mail server for the German research community was ready for operation. This made Karlsruhe University the first non-US research institution outside the United States on CSNet.

The system was used immediately and intensively. The biggest challenges initially were the lack of structured email addressing, transitions to various mostly

proprietary email systems, and usage billing, for which software had to be developed.

At CSNet's request, I also implemented the CSNet software in France at the Agence de l'Informatique in April 1985.

China was later also connected to the Karlsruhe server, with approval from the National Science Foundation (NSF). At that time, Karlsruhe was administratively and technically responsible for operating the name server for the Chinese domain .cn. However, internal unrest in China led to problems in 1989. The names of email senders could be used to easily locate their families in China, potentially leading to their detention. Consequently, the mail operator in China requested that it be disconnected from the network.

CSNet was only a small step away from completing the connection to the ARPAnet, which had been my goal from the start. This was accomplished in the spring of 1985. Since the server name followed the CSNet convention to include the country code (germany.csnet), the name on the ARPAnet likewise became germany.arpa. These network names represented an initial attempt at structuring addresses.

From that point forward, the Informatics Department at Karlsruhe University was fully integrated into the network world of the time. Subsequent tasks involved enabling other scientific institutions to access the Karlsruhe server and programming transitions to existing, closed email systems.

All of this occurred before domain-based addresses (for example, .de or .com) existed. Computer names and addresses had to be stored locally as much as possible. This means, conversely, that data for recipients not connected in Karlsruhe were sent via the United States.

Karlsruhe University bore the costs for connections to and from the United States, hence in both directions, passing them on to German participants. Data transport costs within the US were covered by the American research network (NSFnet).

The ARPAnet was released for commercial use in 1989 when funding for inner-American Internet lines was terminated and the fall of the Berlin Wall led to the lifting of the Iron Curtain. After that, only the Internet remained.

In the mid-1990s, the World Wide Web emerged, leading to the true conquest of the Internet, which in Germany had its origins in 1984 in Karlsruhe University's Informatics Department.

Michael Rotert

079 Student Periodical
"Schärfer bitte!"
(1997)

Rituals with meanings obscure to bystanders is a proven means to foster group cohesion and transmit a sense of exclusivity. The magazine published by the student trade association for mechanical engineers and chemical engineers achieves this with its puzzling title, *Schärfer bitte!* (Sharper Please!). It is rumored that the name originated from a frequently made call to the slide projector operator during mechanical engineering lectures at Karlsruhe University in the 1980s.

Its content, however, is keenly tailored to its audience. The association reports about its events not just toward promoting sociability but primarily toward developing social skills and clarifying career goals. Study-related information features prominently, including exam schedules, updates on curriculum changes, faculty council reports, and interviews of professors. The magazine also offers guidance for students in their personal lives. A serialized story sensitively portrays the student "Hänschen," as the "quintessential mechanical engineer," ↗186 who often goes to his mother's house to get his laundry done, and eventually overcomes his problems with socializing and finds a date. Unsurprisingly, the publication shows little sympathy, if at all, for university administrators or Ministry of Science officials. It seems that every chance is grasped to subject them to criticism, mockery, and biting satire. *kn*

Schärfer bitte!,
Periodical of Fachschaft Maschinenbau/
Chemieingenieurwesen 40,
(May 1997).
KIT Archives 28006/143.

↘ Teaching and Academic Study;
Everyday Life and Culture;
Call for Objects

↩ 021

Object proposal
Schärfer bitte! was the periodical of the Student Association of Mechanical Engineering/Chemical Engineering and was distributed to students since the 1970s until it ceased to appear in 2021. This initially manually made magazine contains many articles and supplementary witty anecdotes that reflect the history of over 40 years of student life at KIT.

Student Association of Mechanical Engineering & Chemical Engineering (Fachschaft Maschinenbau/Chemieingenieurwesen) at KIT

080 O-Phase T-Shirt (1997)

The first semester remains a pivotal moment in the lives of freshmen, nicknamed *“Erstis”* (i.e., “firsties”). To the farewells from parents and settling into new dorms is added adapting to unfamiliar academic operations with initially unfamiliar rules and heightened demands on self-organization. Around 1900, such orientation needs were typically addressed by joining a student fraternity. A century later, fraternities play a much-diminished role. Now, the week-long orientation period, or “O-phase,” eases the transition to university life. Organized by student associations, which are organs of student self-government at the KIT departments, O-phase imparts essential formal and informal knowledge during various organized events. Personal attendance is of utmost importance. Familiarizing oneself with the campus, such as finding the cafeteria, library, culture cafe, Courtyard of Honor, and academic sports facilities, is as vital as understanding study regulations and course modules. Almost of even more importance is making acquaintances, as the starting point of social life as a student.

In October 1997, Alexander Markert volunteered as an O-phase group supervisor for the discipline Economics. The T-shirt shown here points out this function. The garment appears quite subdued compared to the costumes chosen nowadays, which are designed to ensure the visibility of entire newly formed O-phase groups, even at the expense of a slight-to-medium loss of form. *kn*

T-Shirt,
ca. 72 × 59 cm,
cotton.
Private holding.

↘ Teaching and Academic Study;
Everyday Life and Culture;
Call for Objects

Object proposal
The O-phase before the true start of studies left a lasting impression. All of us came from all over the Federal Republic [of Germany], some had just completed their military service, others — like me — their alternative national service. The O-phase was a good opportunity to acquaint yourself with the city and people, and one or two friendships were formed then too. It was especially memorable that the entire program was run by students for students and included a good measure of fun. I later gladly paid this back by serving as an O-phase tutor or as a DJ at the parties hosted by the economics student association at the end of the summer and winter semesters (*WiWiSo* and *WiWiWi*). The T-shirt is an enduring reminder of a good time in Karlsruhe and at KIT.

Dipl.-Wi.-Ing. Alexander Markert,
Frankfurt am Main, freelance head hunter

081 Grave Cross (2009)

Just before the founding ceremony of the Karlsruhe Institute of Technology on October 1, 2009, passers-by noticed plywood grave crosses for the university on the Karlsruhe campus. The living dates “October 7, 1825 – October 1, 2009” revealed that they were in protest against the impending merger with Karlsruhe Research Center. These crosses expressed the mood existing at both the Research Center and Karlsruhe University. Beyond uncertainties about future working conditions, there were fears that one merger partner might stifle the other. The abandonment of the familiar “university” label also may have contributed to the unease. Many a university member and outsider were unaware that “Institute of Technology” is the standard international term for a technical university.

Mergers rarely proceed without some turbulence or confusion. The path to KIT, broached in 2006, initially could not even rely fully on the merger of the two partners occurring, which has now become self-evidential. This goal emerged from arduous negotiations with sponsoring federal and state authorities. That already was reason enough for less certainty at the outset than many desired. The history of the crosses in the KIT Archives certainly gives sufficient reason for confidence: Immediately after the merger, this object served as inspiration for my idea of making a historical exhibition to mark the KIT bicentennial. *kn*

Wooden cross,
137.8 cm × 63.0 × 53.0 cm,
wood, paint, steel nails.
KIT Archives 28506/5.

↘ Everyday Life and Culture;
Milestones in KIT’s History

↩ 009

KIT
(2009–2025)

082 Humanoid Robot
(2006)

ARMAR III is the third member of KIT's ARMAR robot family. It embodies the vision of a robot that learns from humans and interacts with humans in a natural way. Conceived for household use, it demonstrates its capabilities in a kitchen at KIT, where it masters challenging tasks like loading a dishwasher or serving drinks from the fridge. This demonstration environment, the KIT robot's kitchen, has developed into an international standard for household robotics. The research issues during this development of ARMAR III concentrated on materializing holistic cognitive robot architectures, grasping and manipulating everyday objects, including household appliances. Learning new skills from observing humans and from experience, as well as interactions with humans in natural speech, were also a principal focus.

Its human-like torso and mobile platform allow ARMAR III to move flexibly through its working space. The robot has a total of over 43 joints and over 50 sensors, among these, two cameras per eye, moment-of-force sensors, tactile sensors, position sensors, and laser scanners. It is equipped with 5 computers and ten other processor units specialized in very specific operations as well as two batteries, and weighs about 150 kg. Following its completion in 2006, a second version of this robot followed in 2008, ARMAR IIIb.

ARMAR III came to be within the special research focus no. 588 of the German Research Foundation (Deutsche Forschungsgemeinschaft) "Learning and cooperating multimodal robots" and formed the basis of succeeding generations of the ARMAR family. Currently, ARMAR–7, as its youngest member, represents the present state of development of KIT's AI-based humanoid robot family.

Tamim Asfour

Humanoid robot ARMAR III,
maker: KIT Institute of Anthropomatics and Robotics,
height ca. 175 cm,
weight ca. 150 kg.
KIT Institute of Anthropomatics and Robotics.

↘ Research; Innovation

083 Arrangement of International Visitors' Gifts (ca. 1955–2020)

Gifts received during official trips abroad or during visits by leading personalities from other countries, including artfully decorated plates and cups, samples of traditional local handicrafts, university plaques, and elegant technical accessories for everyday use — such objects in this display reflect KIT's global relationships. The diverse connections to the Far East that have developed over many years are next to gifts from across Europe, Russia, the Arabian Peninsula, and the Middle East, as well as North and South America. This display symbolizes internationality — thus aspirations and practices whose essential breadth and diversity cannot be captured by any single object.

International contacts with governing bodies and institutionalized cooperations characterize KIT's past and present, as does the constant flow of students and researchers from abroad. The diversity of partners, employees, and students is as characteristic as the long-term evolution of their origins and the nature of these relationships.

Since the mid-nineteenth century, Karlsruhe Polytechnical College has attracted a significant number of students not only from outside Baden but also from abroad. Over the decades, their countries of origin have changed considerably. Often, students came to Karlsruhe because equivalent technical education was unavailable in their home countries, or was restricted to a select few. The patterns reflected rules for university admission, political upheavals, and forced displacement. Few people know that after World War II, a large proportion of the students were former deported laborers. Karlsruhe Nuclear Research Center saw a constant flow not only of visitors but also of foreign researchers.

The commitment of KIT and its predecessor institutions to developing solutions to globally relevant issues in the natural sciences and engineering makes ongoing international contact and cooperation essential. During the Cold War era between East and West, as well as amid current geopolitical tensions, international contacts could and can still create moments and protected spaces for rapprochement. The presence of international students beyond scientific exchange programs and study visits abroad is important to KIT. Apart from knowledge acquisition and financial benefits for the institution, international networking and horizon-broadening intercultural encounters among individual persons play a vital role. *kn*

Visitors' gifts from Asia, Europe, the Middle East, North and South America.
KIT Service Unit International Affairs,
KIT Archives, KIT, Office of the President.

↘ Research; Teaching and Academic Study; Everyday Life and Culture

084 Drinking Cup of a Traveling Researcher (2022)

From a distance, these two Styrofoam cups could pass as models of a coffee-to-go cup and its smaller expresso version; but, in fact, they were both produced the same size. The duo returned from a research trip with the informatics expert, Alexander Waibel, from KIT to the Titanic shipwreck in 2022. One of the cups took the journey to 3,800 meters depth in a container attached to the outside of the submarine and was compressed to half its original size by the water pressure. Next to the printed logo of the travel agent is added by hand a line drawing of the sunk luxury liner, KIT's logo, the traveler's name, and the date of the dive.

Although this souvenir design seems somewhat sentimental — this trip pursued serious research interests. Anyone who has sat through interminable video conferences during the Covid epidemic knows how important sufficient volumes of data are for this form of communication. From the Titanic wreck, Waibel and his team experimented purposefully under conditions that were brought to extreme limits. Since radio signals don't penetrate through the almost four-kilometer-thick water layer, the communication was based on sound waves. Sonar signals have a range of many kilometers but their data transmission rate is far removed from what a normal video conference needs. To get through this bottleneck, the speech recordings by the conference participants in the submarine were automatically transformed into text and text-only excerpts were sent as data. At the surface, video avatars then converted these excerpts from the speakers inside the submarine back into audiovisual content. This technology developed at KIT generates videos using automatic speech recognition, conversion, and lip-movement synchronization to make this possible. *kn*

Cup (a) at normal size and (b) after having been subjected to the effect of water pressure at 3,800 meters depth near the Titanic shipwreck,
date of travel: Nov. 7, 2022,
(a) 11.2 × 9.0 cm and (b) 6.2 × 4.6 cm,
Styrofoam.
KIT Archives 28506/34.

↘ Research

085 Precision Balance for the Lightest Elementary Particles (2018)

What is the mass of a neutrino? The standard model of elementary particles suggests nil. The overall established view in theoretical particle physics depicts neutrinos as massless, electrically neutral components. However, experimental research has revealed that neutrinos do possess mass, albeit millions of times smaller than the next lightest known particles. This fact, combined with neutrinos' ability to traverse matter almost unimpeded as "ghost particles," makes measuring their mass extremely challenging. Yet, this value is of far-reaching relevance: neutrinos have populated the early universe in vast numbers since shortly after the Big Bang. Today there are over 330 particles per cubic centimeter, making them billions of times more prevalent than atoms and with their small but non-zero mass have influenced the development of the cosmos.

The Karlsruhe Tritium Neutrino Experiment (KATRIN) at KIT is an international collaboration, addressing the neutrino mass question posed in 1930 at a big-science research facility. KATRIN conducts precision spectroscopy of electrons from tritium beta decay. The approximately 70-meter-long, technologically advanced facility was constructed on KIT's North Campus over a period of more than 15 years, commencing measurements in 2018. The Karlsruhe Tritium Laboratory was crucial in its realization, providing expertise and laboratory infrastructure for carrying out KATRIN. The spectrometer's ultra-high vacuum tank, 23 meters in length and 10 meters in diameter, is a striking feature of the facility, rivaling an apartment building in size. This 200-ton stainless steel tank, manufactured in Deggendorf near Passau, undertook an unusual journey to Karlsruhe via the Danube, to circumnavigate Europe by ship, and continue up the Rhine. Its spectacular entry through Eggenstein-Leopoldshafen on the final leg of its journey to the then Karlsruhe Research Center in autumn 2006 drew 30,000 spectators and is likely still remembered by many.

Kathrin Valerius

Big-science instrument KATRIN,
maker: International KATRIN Collaboration,
70 m (installation length),
23 × 10 m (spectrometer tank).
KIT North Campus, Institute of Astroparticle Physics, building 460.

↘ Research; Call for Objects

Object proposal
KATRIN is a unique research installation worldwide, for which KIT offers ideal prospects of success. This experiment about the foundations of physics shows that we often need complex apparatus to track down the tiniest particles.

Kathrin Valerius,
co-spokeswoman of the KATRIN Collaboration

086 The KIT Backpack (ca. 2015)

Karlsruhe and its environs is hardly conceivable anymore without the familiar backpack imprinted with the KIT logo. It is handed out to new students each semester at reduced cost. Its genuine practicality has led to it being widely adopted and it serves as an effective ambassador for the KIT brand. Even members of KIT's presiding board have been spotted with one on the streetcar.

Like many universities, KIT operates a retail store in which the backpack is offered alongside such everyday items as T-shirts, shopping bags, writing utensils, and coffee cups. By distributing such items as gifts to visitors or for the personal use of staff employees, KIT seeks to enhance its brand visibility regionally and beyond. Such merchandise is a key component of the marketing strategy of all major companies, associations, and universities. To make a positive impact on the brand image, it is nowadays essential that such promotional material be ecologically sustainable and not dismissed as disposable. Consequently, KIT's assortment of products focuses on durable consumer goods. *as*

KIT backpack,
ca. 45 × 40 × 19 cm,
synthetic fiber, plastic, metal.
KIT Archives 28506/26.

↘ Everyday Life and Culture; Call for Objects

Object proposal
When I began my studies at KIT in 2018, I received the anniversary edition of the backpack, which was also admired by students in higher semesters. Since then, the backpack has been an essential companion, particularly when I need to transport books to and from the library. It will remain an important keepsake, even though I will soon be completing my studies.

Magdalena Pfeiffer

087 High-Performance Computing Center (2023)

Karlsruhe's current importance as a hub of scientific supercomputing is built on steady development: Since 1983, KIT and its predecessor organizations — Karlsruhe University and Karlsruhe Research Center — have operated over 30 high-performance computers.

Between 1966 and 1996, there was already intense cooperation in this field among computer specialists in the initially separate computing centers of what later would be merger partners. This led to the founding of the Karlsruhe Virtual Computing Center in 1996, which served researchers and students from both the Research Center and the university.

In 1983, the first "supercomputer" — a Control Data Cyber 205 — was installed at Karlsruhe University's computing center. Despite its modest performance of 200 to 800 million computing operations per second (64 bits, 2 pipes) by today's standards, at the time it was considered one of the world's fastest vector computers. KIT's current supercomputer, HoreKa, has achieved 17 quadrillion (= 17×10^{15}) computing operations per second since 2023, making it one of the 15 most powerful computers in Europe. It ranks 52nd in the global TOP500 list of the fastest computers. To put this into perspective: in the 40 years from the Control Data Cyber 205 to HoreKa, there has been a performance increase of eight orders of magnitude, equivalent to an average acceleration factor of 100 every 10 years.

Energy efficiency and sustainability are of great importance in this context. In terms of energy efficiency, HoreKa ranked 13th in the international Green500 supercomputer ranking.

Preparations for the next expansion of computing power are already underway, as researchers increasingly require more. It is needed, for example, for simulations of complex relationships and evaluations of measurement data to gain a more detailed understanding of natural and technical processes. Major areas of demand at KIT include meteorology and climate research, as well as projects dealing with the precise recording of combustion processes in the energy sector. *as*

Karlsruhe high performance computer,
668 GPUs,
>600 Terabyte main storage.
KIT North Campus,
Scientific Computing Center, building 434.

↘ Research

↩ 076

088 Big Tam-Tam (2020)

The 1.3-meter diameter metal disk displayed here is a musical instrument — a tam-tam, also known as a chau gong. This instrument, originating from Chinese music, has been part of the KIT Symphony Orchestra since 2021. It symbolizes the many decades-long musical tradition at Karlsruhe Research Center and the university.

KIT boasts numerous musical ensembles, including the Collegium Musicum, the KIT Symphony Orchestra, and the KIT Concert Choir or also the Big Band. Members of these groups are students, staff, and alumni. Collaborative music-making and other cultural activities foster essential qualities like team spirit, empathy, reliability, and communication skills. Through concerts, numerous tours, and participation in competitions, these ensembles share their passion for music and culture, enhancing KIT's fame beyond its reputation as a scientific institution. *as*

Tam-tam,
130 cm (diameter),
bronze.
KIT Symphony Orchestra.

↘ Everyday Life and Culture; Call for Objects

Object proposal
The tam-tam, with its powerful, low, booming, and rich tone, symbolizes KIT's diverse orchestras. Evidence going back at least 100 years exists of these ensembles creating a wonderful sense of community as an important component of the student experience and KIT's activities in the region, including prize awards even on the federal level. Nowhere else does there exist the possibility to shape culture oneself and convey it to a large audience in such a concentrated space, with such simple accessibility. It is a great pleasure to experience in the rehearsals and concerts so much engagement, solidarity, and skill, and to be able to support it — literally in the positive sense with the "imposing pomp" of a tam-tam.

Hans Richter,
director of KIT Symphony Orchestra

089 Mold for Radioactive Waste (ca. 2000)

This cigar-shaped steel container is a mold designed to hold radioactive waste, facilitating the handling and final disposal of nuclear materials.

As most nuclear activities at Karlsruhe Research Center have terminated, the challenge of disposing radioactive material produced on-site has arisen. The reprocessing plant for spent nuclear fuel, operational from 1971 to 1990, left behind approximately 60 cubic meters of highly radioactive and concentrated liquid nuclear waste. In the 1980s and 1990s, the Institute of Nuclear Waste Disposal (INE), now part of KIT, developed a facility for encasing liquid nuclear waste in glass. The mold for containing this glass-waste mixture was also developed here. In 2009 and 2010, the vitrification plant filled these molds with radioactive waste at temperatures exceeding 800 °C. The mixture solidified into a glass mass, binding the radioactive components. Ongoing decay processes continue to heat the nuclear waste for years, generating surface temperatures on the molds of up to 180 °C. For transport and interim storage, these molds are packed inside shielding containers, such as the Castor type.

Currently, INE is researching methods to isolate nuclear waste from the biosphere in geological formations. Even after Germany's transition away from nuclear energy, the need for a suitable final storage site remains critical. It can take up to a million years for radioactive radiation to decay to natural ambient levels. *kn*

Mold for high-level radioactive waste,
maker: Mechanik Center Erlangen,
133.5 × 43.0 cm,
steel.
Kerntechnische Entsorgung Karlsruhe,
KIT North Campus, building 607

↘ Research; Innovation

↩ 008

090 Climate-Friendly Cement (2010)

In recent years, sustainable and environmentally friendly materials have become a significant focus in the construction sector. Celitement cement is one of KIT's responses to the enormous ecological footprint of modern construction. Celitement is a climate-friendly cement developed at KIT. Compared to conventional cements, its production reduces CO_2 emissions by around 25 %. Its further development toward market readiness is being carried out in a spin-off collaboration with the industrial partner *Schwenk Zement KG*.

The Celitement cube serves as an example of the intersection between research in engineering and systems analysis at the Institute of Technology Assessment and Systems Analysis (ITAS), based at KIT. The development of the cement was supported by a comprehensive study by ITAS on sustainability aspects.

Scientific and technological progress not only improves our lives but also brings about unforeseen and often undesirable consequences as well. ITAS's mission is, to harness the potential of progress while minimizing its risks. Assessing the impact of technologies requires as many points of view as possible. The results of these assessments provide a knowledge base for industry, politics, and society to tackle global challenges, such as sustainable restructuring of energy systems, resilience against the consequences of climate change, or controlling the digital transformation, and is one of the leading institutes of its kind in the world. ↗ 187 *as*

Material sample on display pedestal,
ca. 9.0 × 5.5 × 5.5 cm,
cement and aluminum.
KIT Archives 28506/38.

↘ Research; Innovation;
Call for Objects

Object proposal
We propose this object because it is an example of a rather rare cooperative research practice outside of KIT: a close intermeshing of engineering research, on one hand, and systems analysis and assessment of the consequences of technology, on the other.

Institute of Technology Assessment and Systems Analysis (ITAS) at KIT

Addressing the Institution's History

091 Monument to the Fallen Polytechnicians in the Franco-Prussian War of 1870/71 (1873)

This ornate marble plaque framed in the neo-classical style borrows architectonic elements from the ancient tombs. It was erected in 1873 within the portal of the main building of Karlsruhe Polytechnical College in memory of six students who had lost their lives in the Franco-Prussian War of 1870/71. Normally, such monuments — of which many were erected during the German Empire — were situated in the fallen soldiers' home towns. Their premature deaths were long remembered by members of their own communities. University life, by contrast, was marked by brief periods of attendance and often transient relationships. Yet, the bonds formed during these years were frequently deep and lasting. To have them cut short by death was painful too.

The war memorial of the Polytechnical College was designed by its professor of architecture, Heinrich Lang (1824–1893), and was built with public funds. By erecting this memorial to its members, the 48-year-old college at that time was following the lead of other academic institutions. It was one more step along the path toward achieving equality with universities, something it was striving for throughout the nineteenth century. Their corporative isolation from local urban communities was a centuries-long characteristic of universities. The Polytechnical College, although founded without such special status, joined this tradition symbolically by erecting its war memorial, thereby establishing itself as an independent social entity. *kn*

War memorial,
design: Hermann Lang,
erected 1873,
ca. 5.1 × 2.3 m,
sandstone and marble.
KIT South Campus, portal of the main building,
Kaiserstraße 12.

↘ Everyday Life and Culture

↩ 093

092 Polytechnicians' Pageant (1877)

The tradition of parades, processions, and marches dates back to antiquity, to celebrate victories or religious events. Processions celebrating the birthday of a ruler, an anniversary of his accession to the throne, or a wedding were also popular. The prevailing interest in history during the nineteenth century led to a revival of processions in historical costume. This fashion also caught on in Karlsruhe, and on April 30, 1877, a "pageant of the students of the Karlsruhe Polytechnical College" was held during festivities honoring the 25th anniversary of the reign of Grand Duke Friedrich I in Baden. ↗[188] The individual Technical Schools presented themselves with their historical insignia. A commemorative volume of this occasion is illustrated with photographs of groups representing mathematicians, architects, chemists, mechanical engineers, civil engineers, and foresters. Karlsruhe Polytechnical College proudly viewed itself within the tradition of earlier researchers, architects, and scientists who had shaped their respective disciplines with their knowledge and discoveries. It simultaneously honored the Grand Duke as the institution's committed patron.

The procession of subjects taught at the Polytechnical College appeared in the following sequence:

Mathematics: Following the banner featuring a globe (of the world), Pythagoras appears, carrying a visual representation of his theorem. Archimedes follows, holding the screw that bears his name. The procession includes several women in Roman and Greek attire, along with men similarly dressed, carrying representations of various Platonic solids. They are followed by a blackboard display of an integral of a root function. Bringing up the rear are gentlemen in orientally inspired robes, and in costumes representing the Middle Ages and the Renaissance.

Architecture: The train behind the banner begins with a figure — presumably — Vitruvius, accompanied by men carrying a model of a pillared temple entrance in the Doric order. Next comes a group dressed as medieval monks, symbolizing the architects of the great cathedrals, followed by a team of stonemasons bearing a detailed model of the Ulm Minster.

Chemistry: The banner depicting a scale and a distilling apparatus heads a procession of men dressed as medieval monks, representing early alchemists. They are followed by miners carrying a model of a coal mine. Further along, other men are carrying glass flasks, while others are bearing a model of a chemical factory.

Mechanical Engineering: Proceeding behind the banner are groups dressed in costumes from various eras, ranging from the Middle Ages to the Baroque period. They are carrying models of a water wheel, a pump, a cogwheel, and a crane.

Civil Engineering: The banner adorned with symbols of earthworks, building design, and shipbuilding is followed by a model railway complete with a railroad embankment, bridge, steam locomotive, and train. Workers carrying tools for earthworks accompany it. Next come miners dressed in costumes representing various eras, carrying a tunnel model. Finally, bridge builders and shipbuilders bring up the rear of their procession, each presenting their respective models.

Forestry: Young men dressed in traditional forester's garb display weapons and hunting trophies, including stuffed birds and hares. At the center of the procession one sees a falconer and a dog handler. *as*

Festzug der Studirenden des Polytechnikum zu Karlsruhe beim Festcommers zu Ehren des 25jährigen Regierungsjubiläum Seiner Königlichen Hoheit des Großherzogs Friedrich von Baden,
April 30, 1877,
phototype: Schober & Baeckmann,
Verlag des Polytechnischen Vereins Karlsruhe,
undated,
photographer: Adalbert Uetz,
47.5 × 30.4 cm.
KIT Archives 27084/18

↘ Everyday Life and Culture

093 Pallas Athena (1925)

To mark the centenary of Karlsruhe Polytechnic in 1925, a war memorial was commissioned for the space between the first buildings of the original college in honor of members who had lost their lives in World War I. In spring 1924, the rectorate awarded the contract to the architect and ceramist Max Laeuger (1864–1952) and the sculptor Karl Albiker (1878–1961). Laeuger's new courtyard design formed the podium for Albiker's monumental sculpture of the goddess Pallas Athena. The pedestal inscription reads: "Fridericiana in memory of the fallen." Beneath are engraved the names of polytechnicians who had perished during World War I. The fallen in the war of 1870–71 are also named even though a memorial for them already existed. Karlsruhe University's celebrations fifty years later, in 1975, lent the occasion for landscape architect Gunnar Martinsson (1924–2012) to revise the design of this Courtyard of Honor.

Pallas Athena, the Greek goddess of wisdom, is considered the patron of knowledge and scientific inquiry. She also governs war, peace, and the defense of the homeland, which makes her a fitting motif for an academic war memorial. Her depiction here is not of a bat-

tle-ready goddess. Instead of assuming a warlike stance, she rests her round shield easily on her arm, her lance is lowered, and the visor of her helmet is propped up toward the sky to expose her face. She is dressed in a loosely draping toga. Grief seems to shape her expression, her stance is upright, yet the forward step suggests imminent motion.

As the collection of monuments in the Courtyard of Honor evolved over time, its intuitive dedication also gradually shifted. The 1863 monument to Ferdinand Redtenbacher focused on the recognition of exceptional scientific achievement. The war memorial and the memorial plaque for victims of Nazi persecution elicited, on one hand, mourning and, on the other hand, critical reflection on history. The monuments dedicated to Carl Benz, Friedrich Eisenlohr, Heinrich Hertz, and Otto Lehmann honor other individuals renowned for their remarkable merits. *as, kn*

Monumental sculpture of Pallas Athena,
design: Karl Albiker,
erected in 1925,
pedestal width 2.50 m, length 2.15 m,
height 1.48 m,
figure width with weapons ca. 3.45 m,
length with spear ca. 3.70 m, height ca. 4.10 m,
pedestal: sandstone,
figure: bronze.
KIT South Campus, Ehrenhof.

↘ Everyday Life and Culture;
Milestones in KIT's History

↩ 091; 098; 099

094 Plaque in Memory of Gas Chemist Hans Bunte (1932)

On the 25th anniversary of the Gas Institute at Karlsruhe Polytechnic, students and employees of the chemist Hans Bunte (1848–1925) celebrated the institute's founding in 1907 with a memorial plaque. Hans Bunte's son Karl Bunte (1879–1944) was one of these initiators in both capacities. Shortly after the institute's establishment as a teaching and research facility of the German Association of Gas and Water Experts (DVGW), Hans's son assumed a leading position there. Karl Bunte had earned his habilitation degree at Karlsruhe Polytechnic in 1917 and was appointed Professor of Fuel Chemistry in 1920. Hans Bunte's retirement in 1919 facilitated this familial succession, a practice that would go against regulations today as a conflict of interest. Karl Bunte endeavored to construct a spacious new building for the Gas Institute. Initially, this project progressed only as far as the laying of the foundation stone in 1939; a new building was eventually completed in 1961. *kn*

Memorial plaque,
design: A. Walter,
cast: A. Komo & Sohn/Frankfurt am Main,
probably 1932,
103.5 × 59.5 cm,
bronze.
KIT South Campus, Engler Bunte Institute,
building 40.12.

↘ Research; Everyday Life and Culture

↩ 029

095 Memorial Plaque on the Development of Ammonia Synthesis (1990)

This bronze plaque, measuring approximately 50 by 60 centimeters, features the development of ammonia synthesis by Fritz Haber (1868–1934) and Carl Bosch (1874–1940). Its role in fertilizer production alone makes this process one of the most significant in the chemical industry. It is estimated that around 40 % of the nitrogen in the body of a person living in an industrialized nation has undergone this ammonia synthesis process. The fundamental research conducted at Karlsruhe Polytechnic on ammonia production prompted acknowledgment of this work by turning a decommissioned synthesis reactor into a monument on the university campus in 1990. The plaque attached to the reactor column at that time lauds Haber's fundamental laboratory work, presenting impressive data, along with Carl Bosch's success in scaling the process for industrial application at *Badische Anilin- und Sodafabriken* (BASF). The Nobel prizes awarded to both scientists are also mentioned. This memorial is thus focused on the volume of production of synthetic ammonia and on its public reception. The plaque notably omits Haber's controversial role in developing poison gas during World War I and the use of ammonia for the production of explosives as a weapon of war. This omission may well have prompted the addition of another plaque to the reactor column, addressing Haber's supervisory role in the deployment of poison gas and Bosch's in the production of explosives. *kn*

Memorial plaque,
maker unknown,
presumably 1990,
49.8 × 58.0 × 1 cm (without curvature),
bronze.
KIT Archives 28502/38.

↘ Research; Innovation;
Everyday Life and Culture

↩ 033; 036; 096

096 Plaque in Protest of Chemical Weapons (1991)

As a critical counterpoint to the tribute paid to Fritz Haber (1868–1934) and Carl Bosch (1874–1940) for developing ammonia synthesis, another plaque probably in 1991 was affixed to the synthesis reactor, which had just recently been erected on the Karlsruhe University campus as a technical monument. This plaque is made of cast iron and was secured to the reactor column with a heavy chain. Its weight of 44.5 kg alone demonstrates the gravity of its message, allegedly authored by an activist university peace group at the time. The text mirrors the inscription on the bronze plaque already attached to the reactor column honoring Haber and Bosch. But on this one, after the names of each scientist, there follows information about the consequences of their objectionable activities — in Haber's case, the thousands killed and wounded by poison gas, and in Bosch's, the mass-production of explosives based on ammonia. This postscript "simultaneously" makes the reactor column a portent "memorial against the worldwide use of chemical weapons." This plaque is not the sole evidence of critical views on Fritz Haber's work at his former workplace, notwithstanding the merits of ammonia synthesis. There are also traces of a paint-bag impact on the reactor column and an almost completely faded, decades old inscription in white paint under a skull and crossbones, reading "MURDERER." Haber's name has been repeatedly crossed out in thick black pen on the nearby "Fritz-Haber-Weg" street sign.

At an unknown point in time, the memorial plaque and its critical rebuttal were both removed from the ammonia reactor. This action can be regarded as a concession that a historical account solely directed at accomplishments is no longer defensible. *kn*

Protest plaque,
maker unknown,
probably 1990–1991,
68.0 × 48.5 × 1.5 cm (without fixtures),
cast iron.
KIT Archives 28502/37.

↘ Everyday Life and Culture

↩ 033; 036; 095

097 Plaque on Research Reactor FR 2 (ca. 1995)

The plaque on the reactor housing of research reactor FR 2 displays key operating data of the facility. The construction of the reactor shortly after the founding in 1956 of Karlsruhe Nuclear Research Center was a milestone achievement. Operational until its shutdown in late 1981, FR 2 was utilized for research purposes and for the production of radionuclides for nuclear medicine, but it was never used to generate electricity. Following approval for controlled decommissioning in 1986, a significant step was achieved in 1996 with the encapsulation of the reactor core, in preparation for its dismantling. The reactor building is accessible today without any radiation monitoring needed, allowing visitors to approach and even touch the reactor block directly. Its full dismantling remains in the planning stages, with demolition work projected to begin in the 2030s. In the meantime, the reactor serves as a technical monument on KIT's North Campus and remains open to visitors.

In the mid-1990s the Center was in a period of transformation when the dedicated plaque was made. Initially founded as a center for nuclear research, the organization diversified its focus to include environmental science, fundamental physics, energy research, materials science, and medical technology. This shift from the institution's identity-forming original mission of atomic research generated a desire to secure for posterity the achievements made in this area. *kn*

Memorial plaque,
maker unknown,
139.0 × 139.0 × 3.0 cm,
cast aluminum.
Kerntechnische Entsorgung Karlsruhe.
KIT North Campus, building 607.

↘ Everyday Life and Culture

↩ 008

098 Carl Benz Monument (2007)

As KIT's most renowned alumnus, Carl Benz (1844–1929) has a memorial dedicated to him in the KIT Courtyard of Honor. Born in Karlsruhe's Mühlburg district, Benz studied mechanical engineering at Karlsruhe Polytechnical College from 1860 to 1864. This education was important for his subsequent inventive work. Although internal combustion engines were not yet part of the curriculum at the Polytechnical College, Benz acquired the necessary tools for engine design. In 1885, Benz reportedly drove a three-wheeled vehicle he had built himself, powered by a four-stroke internal combustion engine, for the first time. He applied for a patent for his design in early 1886.

Benz's fame stems from the success of his invention, which was practical, mass-producible, and marketable. The monument to him was erected in 2007 next to the building of today's KIT Department of Mechanical Engineering, which already existed in his student days. It stands on the green strip between the western façade and the pavement on the Courtyard of Honor. This location for the sandstone column with bronze relief and inscription, financed by Daimler AG, was chosen because it was erected by the university faculty at its own initiative. The monument symbolizes the longstanding relationship between the sponsoring company and the faculty, encompassing decades-long training of specialists, exchanges among top personnel, and research collaborations. Benz's role as the "inventor of the automobile" in the dedicatory inscription is a reduction. Trackless motor cars had already been built as experimental prototypes prior to Benz's. However, the commercial success of his motor car and the ensuing company history focused public attention on this particular inventor. *kn*

Monument,
donor: Daimler AG,
plaque 90.0 × 60.0 × 3.0 cm
(without mounting bracket),
height 203.0 cm, width 81.0 cm, length 39.0 cm,
bronze plaque on sandstone pedestal.
KIT South Campus, Ehrenhof.

↘ Teaching and Academic Study; Innovation; Everyday Life and Culture

↩ 018; 019; 093

099 Memorial Plaque Dedicated to the Victims of National Socialism (2016)

A square bronze plaque, measuring 1.34 meters on each side, memorializes victims of persecution during the National Socialist regime at Karlsruhe Polytechnic for ideological, political, or racist reasons, or injustice in other ways. The expulsions of Jewish and politically unpopular professors and academics began in spring 1933, resulting in about a quarter of the Polytechnic's professors losing their positions. The plaque, dedicated by the KIT Presidential Board and Senate in 2016, assesses these persecutions as a breach "of fundamental values of humanity and tolerance." Its central placement on the platform in the Courtyard of Honor on KIT's South Campus exposes the Nazi persecutions as a conspicuous part of the institution's history. By also formulating a caution, this memorial plaque broadens the scope of institutional history beyond the memorable and worthy achievements represented elsewhere in the Courtyard of Honor. It highlights the values essential to scientific institutions and society as a whole, which had been so egregiously violated under National Socialism, and which must be defended against offenses in future. *kn*

Memorial plaque,
1.34 × 1.34 m,
bronze.
KIT South Campus, Ehrenhof.

↘ Everyday Life and Culture

↩ 093

100 Student Flyer (2022)

Criticism by students of their university and its political environment is integral to enriching the intellectual life of any academic institution. Without it, an important stimulus to question existing conditions would be lost. Such criticism does not shy away from passing judgment on the institution's history and its notable figures. In 2022, a critique appearing in a series at KIT called *"Klolektüre,"* which translates as "lavatory reading," lambasted the computer science pioneer Karl Steinbuch and protested against KIT's computing center being named after him. It is written in the drastic style typical of the series. The introductory scatological language used in all its issues: "Scheiß auf …" borders here on personal injury, being directed at a particular individual. This "lavatory reading" does cite the latest findings on this matter but inaccuracies have also slipped in. For example, there is no clear documentary evidence that as

a soldier during World War II Steinbuch had in fact ordered a female prisoner of war to be shot, as the leaflet claims. Nor could the naming of KIT's computing center after Steinbuch in 2008 have occurred "in full knowledge" of his activities during the Nazi era, simply because the relevant scholarly revelations it cites had only been published years later.

However, some accusations in the leaflet can be substantiated. Subsequent inquiries into Steinbuch's biography prompted the decision in 2024 not to name KIT's computing center after him anymore. Through their action, the persons behind the "lavatory reading" issue underscored the urgency of having an official statement made. *kn*

Die Klolektüre,
January 2022, No. 1.
KIT Archives 28005/146.

↘ Research; Teaching and Academic Study; Everyday Life and Culture

↩ 056

On the Role of Student Protest in the Steinbuch Case

The *Klolektüre* calling for a renaming of the computing center at KIT, at that time officially called Steinbuch Center for Computing, falls under the category of a flyer or handbill. The essential criteria of a flyer are evident in its designation: rapid, uncontrolled, and widespread distribution; topicality and transience; yet, as a printed product, it provides an archivable and lasting contribution to discourse.

This flyer was published anonymously and very likely originated from the student milieu, especially as it is part of a series addressing student issues, such as dormitory availability or student associations (Fachschaften). It can be situated within a politically left-wing context, including other "targets," such as German Chancellor Olaf Scholz or the author Joanne K. Rowling.

Left-wing and radical left-wing agitation has been a motif in student flyers since at least 1968. Such handbills thrive on scandal, either by being scandalous, like that anonymous applause of the RAF terrorists in the 1970s, or by seeking scandal for better effect.

The exhibited flyer contains a double scandal. Despite its offensive scatological language, the dialog does not automatically disqualify the anonymous authors. The scandalous content is far more serious: the Nazi past of Karl Steinbuch, the namesake of the computing center. He had been a member of the NSDAP and the SS and an active participant in the Nazi war of extermination.

The flyer is based on historical research, although without making reference to it. Including such would have revealed that a historian researcher had been free to conduct this research on Steinbuch as an employee of KIT, with the support of the director of the Department of History and the KIT Archives, and could publish the findings in 2020 — without a scandal being raised.

Consultations by university committees ensued and ultimately the decision was reached to rename the computing center. This was a late victory for Steinbuch's opponents, who over the decades had been numerous. That outspoken professor had attracted student attacks as early as the 1970s.

Through the Steinbuch case, object 100 thus demonstrates that remembrance at a university is subject to constant change and is continually being renegotiated. It also shows that actors from all status groups can exert influence on how KIT relates to its history.

Anton F. Guhl

Notes for the Object Texts

General remarks about the sources and abbreviations used are on page 178.

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Sources

Texts
The texts in this volume come from the indicated authors. They do not necessarily agree with the views of the editor.

Unless otherwise indicated, the object descriptions are by Andrea Stengel (as) and Klaus Nippert (kn).

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Albayrak, Mikail: On the Development of Akaflieg AK–1 (commentary on 075), p.288.

Asfour, Tamim: Humanoid Robot (article on 082), p. 309.

Becker, Michael E. and Wöhler, Henning: From the Carrot to the Flat Screen… (commentary on 024), pp. 216–217.

Birn, Marco: On the Introduction of Women into Academic Study in Germany (commentary on 028), pp. 219–220.

Bockhorn, Henning: Hans Bunte's Research and Development in Technology (commentary on 029), pp. 220–221.

Görke, Winfried: How the Learning Matrix Works (commentary on 056), pp. 273–274.

Guhl, Anton F.: Two Views on Denazification (commentary on 052), p. 255.

Guhl, Anton F.: On the Role of Student Protest in the Steinbuch Case (commentary on 100), p. 320.

Kind, Matthias: On the Role of Chemical Engineering (commentary on 038), pp. 243–244.

Kunze, Rolf-Ulrich: Maneuvering Room during the Dictatorship (commentary on 044), pp. 248–249.

Männig, Maria: The Landern-Slide Presentation as a Medial Innovation (commentary on 021), p. 213.

Mönnich, Michael: The Periodic System of the Elements and the Karlsruhe Congress of Chemists (commentary on 011), pp. 191.

Möser, Kurt: Hydrogen as an Alternative Energy Source for Private Transport (commentary on 067), pp. 282.

Nick, Peter: see Puchta.

Popplow, Marcus: Drawings in Engineering (commentary on 023), pp. 215–216.

Puchta, Holger and Nick, Peter: Karlsruhe as the Cradle of Genetics (commentary on 012), p. 192.

Rotert, Michael: Eye-witness Report (commentary on 078), pp. 306–307.

Sattelmacher, Anja: Modern Models (commentary on 020), p. 212.

Savio, Enrico: Redtenbacher's Work in the Context of Intellectual History (commentary on 017), p. 210.

Scharenberg, Swantje: On the Design of the Academic Sports Stadium in Karlsruhe (commentary on 040), p. 245.

Schulz, Joachim (†): Application of the LIGA Process in the Construction of Microcomponents (commentary on 069), p. 284.

Sóti, Zsolt: Karlsruhe Nuclide Chart – Insights into Its History (commentary on 060), pp. 277–278.

Valerius, Kathrin: Precision Balance for the Lightest Elementary Particles, (article on 085), p. 311.

Weindel, Anja: Outcome of a Quest for Meaning (commentary on 068), p. 283.

Wöhler, Henning: see Becker.

Zwick, Thomas: Freedom of Research 140 Years Ago (commentary on 022), p. 215.

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Image Index

001
page 33
Detail from a group portrait of Freiburg professors. Lithograph by P. Wagner/Karlsruhe, early 19th century, 8.0 × 9.5 cm. Freiburg University Archives D13/577.

002
page 34
Repeating theodolite, maker: Baumann/Stuttgart, ca. 1820, ca. 30.0 (diameter) × 35.0 cm, brass and other metal, glass. KIT, Geodetic Institute. Photography: Amadeus Bramsiepe and Jonas Zilius.

003
page 35
August Moosbrugger, sketchbook, ca. 1824, ca. 22.0 × 15.0 cm. saai | Archive for Architecture and Civil Engineering at KIT, MOSB_SB_001.

004
page 36
Founding charter of the Karlsruhe Polytechnical College by Grand Duke Ludwig I of Baden, October 7, 1825, 34.5 × 23.5 cm, paper. Karlsruhe General State Archives 235/4106, page 1 (sheet 1r).

page 37
Founding charter, page 2 (sheet 1v).

page 38
Founding charter, page 3 (sheet 2r).

005
page 39
Programm der Großherzoglich Badischen Polytechnischen Schule Karlsruhe für das Jahr 1832–33. (Karlsruhe 1832), ca. 19.5 × 24.8 cm, 34 pages. KIT Library Archiv IV, 01.

006
page 40
Installation of a signpost to the Karlsruhe reactor station, photographer unknown, April 13, 1957, 6.0 × 6.0 cm, black-and-white negative. KIT Archives 28028/11813.

007
page 41
Electric forearm prosthesis, maker: Reinhold Reiter, ca. 1945, ca. 43.5 × 8.5 cm (diameter), wood, metals, and other materials. KIT Alpine Campus, Institute of Meteorology and Climate Research, Atmospheric Environmental Research Department, Garmisch-Partenkirchen. Photography: Amadeus Bramsiepe and Jonas Zilius.

008
page 42
Model of the heavy-water-moderated nuclear reactor Forschungsreaktor 2, June 9, 1962, 6.0 × 6.0 cm, black-and-white negative. KIT Archives 28028/12401.

page 43, top
View of research reactor 2 from the exhaust chimney from the northwest, March 30, 1965, photograph of unknown authorship. KIT Archives 28028/145100.

page 43, bottom
View into the reactor hall of research reactor 2, April 21, 1965, photograph of unknown authorship. KIT Archives 28028/02768.

page 44
View of the reactor block of research reactor 2 with refueling machine and experimental setups on the beam channels, March 1976, photograph of unknown authorship. KIT Archives 28028/04805.

009
page 45
KIT logo, 2006, abstract pattern with a specified shape and color. Its use is reserved to KIT as a registered trademark.

010
page 46
Model of spherical sections, maker: Berckmüller & Messmer/Karlsruhe, 1833, 19.2 × 21.4 × 19.2 cm, brass and paper. KIT Archives 28508/54. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 47, top and bottom
Model of spherical sections, maker: Berckmüller & Messmer/Karlsruhe, 1833, 19.2 × 21.4 × 19.2 cm, brass and paper. KIT Archives 28508/54. Photography: Amadeus Bramsiepe and Jonas Zilius.

011
page 48
Wall chart with the periodic table of the elements, maker: Ernst Klett Verlag/Stuttgart, 1962, 194.7 × 133.3 cm (without rods). Bismarck-Gymnasium Karlsruhe. Photography: Amadeus Bramsiepe and Jonas Zilius.

012
page 65
Herbarium page, ca. 1840, ca. 28.1 _ 22.3 cm (all mounted specimens). State Natural History Museum Karlsruhe KR0193703. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 66
Herbarium page with Lycopodium annotinum L. State Museum of Natural History Karlsruhe.Photography: Amadeus Bramsiepe and Jonas Zilius.

013
page 67
Kneipbild with silhouette of Arthur von Eck and dedication to Franz Schaedel, 1844, KIT Archives 28005/36. Photography: Amadeus Bramsiepe and Jonas Zilius.

014
page 68
School-leaving certificate from Karlsruhe Polytechnical College for Heinrich Sprenger, October 15–21, 1831. KIT Archives 29002/1.1.2, page 1 (sheet 1r). Photography: Amadeus Bramsiepe and Jonas Zilius.

015
page 69
File on the exodus of students from Karlsruhe Polytechnical College to Ettlingen, 1848–1849. KIT Archives 10001/326. Photography: Amadeus Bramsiepe and Jonas Zilius.

016
page 70
First matriculation roster of Karlsruhe Polytechnical College, 1852–1859. KIT Archives 21003/1. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 71, top
First matriculation roster, Oblique view. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 71, bottom
First matriculation roster, View of the spine. Photography: Amadeus Bramsiepe and Jonas Zilius.

017
page 72
Ferdinand Redtenbacher: Hohentwiel bei Singen, 1858. KIT Archives 28501/18. Photography: Amadeus Bramsiepe and Jonas Zilius.

018
page 73
Gear model for non-uniform periodic motion transmission by means of non-circular gear wheels, ca. 1850. KIT Department of Mechanical Engineering, Redtenbacher Collection. Photography: Amadeus Bramsiepe and Jonas Zilius.

019
page 74
Ferdinand Redtenbacher: Lecture on Mechanical Engineering (Maschinenbau), 1. Course, in notes by Carl Wenger, 1856–1857,, p. 208. KIT Library III E 487/1.

page 75
Lecture on Mechanical Engineering, p. 209.

020
page 76
page 77, top and bottom
Model of the 3rd-degree Cayley plane, maker: Bartholomeus Hendriks, 1887. KIT Archives 28508/12. Photography: Amadeus Bramsiepe and Jonas Zilius.

021
page 78
Lantern slide of a graphic reproduction of Titian's *La Bella* (1536), published by Bruno Meyer, ca. 1885. KIT Archives 28002/872. Photography: Amadeus Bramsiepe and Jonas Zilius.

022
page 79
The apparatus Heinrich Hertz used to investigate electromagnetic waves. Photograph after 1886, unknown photographer. KIT Archives 28010/I 3152 (reproduction of an original in Deutsches Museum, Munich).

page 80
Concave mirror constructed by Heinrich Hertz with wave transmitter and wave receiver, photo taken ca. 1950, photograph of unknown authorship. KIT Archives 28010/I 3157.

023
page 97, top and bottom
Ferdinand Lehn: Drawing exercises from his studies in civil engineering at Karlsruhe Polytechnic, 1891–1893, page 21. KIT Archives 28016/31. Photography: Amadeus Bramsiepe and Jonas Zilius.

024
page 98
Polarizing microscope, ca. 1890. KIT Archives 27059/160. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 99
Otto Lehmann in the laboratory, ca. 1908, photograph of unknown authorship. KIT Archives 27059/34.

025
page 100
Big Book of Doctorates awarded by Karlsruhe Polytechnic, 1901–1927. KIT Archives 21013/50551. Photography: Amadeus Bramsiepe and Jonas Zilius.

026
page 101
Chain of office for the rector of Karlsruhe Polytechnic. Karlsruhe Institute of Technology, Office of the President. Photography: Ricardo Prevete.

027
page 102
Memorial plaque, from 1902 on. KIT Archives 28502/39. Photography: Amadeus Bramsiepe and Jonas Zilius.

028
page 103
Magdalena Neff (née Meub) in the Löwen pharmacy in Ehingen, 1906, photograph by unknown author. KIT Archives 28010/I 7885 (original by Dr. Rüdiger Rombach/ Ehingen).

029
page 104
Certificate of honorary membership in the Bavarian Association of Gas and Water Experts for Hans Bunte, October 23, 1910. KIT Archives 27055/67. Photography: Amadeus Bramsiepe and Jonas Zilius.

030
page 105
Robe of Professor of Chemistry Ernst Ulrich Franck (1920–2004), ca. 1961. KIT Archives 28507/2. Photography: Amadeus Bramsiepe and Jonas Zilius.

031
page 106
Beer stein, 1913. KIT Archives 28510/1. Photography: Amadeus Bramsiepe and Jonas Zilius.

032
page 107
Calculation table ("Tafel I") for anti-aircraft fire, 1915. KIT Archives 28508/60. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 108, top
Calculation table ("Tafel 3b") for anti-aircraft fire, 1915. KIT Archives 28508/59. Photography: KIT Archives.

page 108, bottom
Calculation table ("Tafel 4c") for anti-aircraft fire, 1915. KIT Archives 28508/56. Photography: KIT Archives.

033
page 109
Ernst Schlumberger: Fritz Haber as a Gas Warrior, from 1915 on. KIT Archives 28015/2. Photography: Amadeus Bramsiepe and Jonas Zilius.

034
page 110
Doctoral certificate from Karlsruhe Polytechnic, November 27, 1915. KIT Archives 21013/248.

035
page 111
Emergency money voucher of the Karlsruhe Association of Student Services, October 10, 1923. KIT Archives 28009/35. Photography: Amadeus Bramsiepe and Jonas Zilius.

036
page 112
Reactor for ammonia synthesis using the Haber-Bosch process, 1923. KIT Campus South. Photography: Amadeus Bramsiepe and Jonas Zilius.

037
page 129
Voltmeter with measuring range up to 10 volts. KIT Archives 28509/102. Photography: Amadeus Bramsiepe and Jonas Zilius.

038
page 130
Model of a fractionating column, 1930. KIT, Institute of Thermal Process Engineering. Photography: Amadeus Bramsiepe and Jonas Zilius.

039
page 131
Table knife from the Karlsruhe Studentenhaus, maker: Gebrüder Hepp/Pforzheim, ca. 1930, 25.2 × 2.3 × 1,2 cm, metals. KIT Archives 28506/1. Photography: Amadeus Bramsiepe and Jonas Zilius.

040
page 132, top
Grandstand of the university stadium, ca. 1935, photograph of unknown authorship. KIT Archives 28010/I 3665.

page 132, bottom
Grandstand of the university stadium, presumably 1931, photography: Schlitz. KIT Archives 28010/I 3661.

041
page 133
Sistrah lamp, ca. 2015. Private holding. Photography: Amadeus Bramsiepe and Jonas Zilius.

042
page 134
Hermann Alker: Design for a "Thingstätte" near the stadium of Karlsruhe Polytechnic. Illustration from the newspaper article: Thingstätten der Südwestmark by R. Alker, in: Volksgemeinschaft, May 10, 1934, no. 136, p. 10.

043
page 135
Sheet metal sign, presumably 1934. KIT Archives 28506/27. Photography: Amadeus Bramsiepe and Jonas Zilius.

044
page 136
Anonymous postcard to Karlsruhe Polytechnic, 1936. General State Archives Karlsruhe 235/2478.

045
page 137, top and bottom
page 138, top and bottom
Film stills from the movie “Engineers out! A film about technical university studies”, 1937. KIT Archives 28504/52.

046
page 139
Werner Gaedcke, Friedmar Grundig, Walter Hodapp, Walter Hublow, Willi Schramm, Alfred Winkels and Emil Ziegler: Heinrich Hertz in seinem Wirken und Schaffen unter besonderer Berücksichtigung seiner rassischen Gebundenheit, 1938, mimeographed typescript. KIT Archives 27104/11. Photography: Amadeus Bramsiepe and Jonas Zilius.

Seite 140
Gaedcke, Werner et al.: Heinrich Hertz in seinem Wirken und Schaffen […], p. 3.

047
page 141
Personnel file on Professor Rudolf Georg Weigel, 1932–1972. KIT Archives 21011/538. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 142, top
Rector Rudolf Weigel at the speaker's lectern, ca. 1938, photography: Ilse Laurson. KIT Archives 28010/I 765.

page 142, bottom
Rector Rudolf Weigel (1st row far left) at the laying of the foundation stone for the new Gas Institute building, February 26, 1939, photography: Atelier Bauer. KIT Archives 28010/I 7901.

048
page 143
Instrument for measuring carbon dioxide in room air, 1943. KIT Archives 28509/4. Photography: Amadeus Bramsiepe and Jonas Zilius

page 144, top and bottom
Details of Instrument for measuring carbon dioxide in room air. Photography: Amadeus Bramsiepe and Jonas Zilius.

049
page 161
Doctoral certificate from Karlsruhe Polytechnic, March 18, 1944. KIT Archives 21013/1069.

050
page 162
Portrait of Annemarie Geierhaas, ca. 1940, photography of unknown authorship. KIT Archives 28010/I 3642.

page 163
Portrait of Hilde Becht, ca. 1945, photography of unknown authorship. KIT Archives 21003/300.

051
page 164
Name and dedication plate of the Karlsruhe Polytechnic's stadium, presumably 1945–1950. KIT Archives 28506/30. Photography: Amadeus Bramsiepe and Jonas Zilius.

052
page 165
Tribunal verdict on Emil Kirschbaum, July 23, 1947, page 1. KIT Archives 21011/209.

053
page 166, top and bottom
page 167, top and bottom
page 168
Travel diary by Maria Fischer, 1951–1952. saai | Archive for Architecture and Engineering at KIT, GIESM. Photography: Amadeus Bramsiepe and Jonas Zilius.

054
page 169
Drawing table [E1], design: Egon Eiermann, ca. 1955. saai | Archive for Architecture and Engineering at KIT, EE_Moe_52. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 170
Frame of Drawing table [E1]. Photography: Amadeus Bramsiepe and Jonas Zilius.

055
page 171
Briefcase, ca. 1910. KIT Archives 28506/28. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 172, top
Briefcase, Property details of the key. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 172, bottom
Briefcase, Circulation plate of the briefcase. Photography: Amadeus Bramsiepe and Jonas Zilius.

056
page 173, top and bottom
Learning matrix for automatic character recognition, 1960. KIT, Institute of Information Processing Technology (ITIV). Copyright: Karlsruhe Institute of Technology.

page 174, top and bottom
Film stills from an explanation of the learning matrix by Prof. Winfried Görke, 2024. Copyright: Karlsruhe Institute of Technology.

057
page 175
Magnetic core memory, ca. 1965. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 176
Close-up of the memory cores. Photography: Amadeus Bramsiepe and Jonas Zilius.

058
page 193
page 194
page 195
Photo album of surveying studies at Karlsruhe University, photographer unknown, layout: Volker Schäfer, from 1967 on. Private holding. Photography: Amadeus Bramsiepe and Jonas Zilius.

059
page 196
Poster by Studiobühne at Karlsruhe Polytechnic, 1955. KIT Archives 28008/10. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 197, top and bottom
Scene photo from a performance of the play “Fünf Mann, ein Brot” by Hermann Rossmann, 1955, photography: Harald Andres. KIT Archives 28008/9.

060
page 198
The Karlsruhe nuclide map in a seminar room at KIT Campus North. Photography: Amadeus Bramsiepe and Jonas Zilius.

061
page 200
Karlsruhe standard bricks for shielding i onizing radiation. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 201
Experimental setup with standard bricks at the European Institute for Transuranium Elements, 1967, photograph of unknown authorship. KIT Archives 28028/14975.

062
page 202
ARISTO No. 10174 Radiation protection slide rule by Frieseke & Hoepfner GmbH, 1958. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 203, top
Employee of the Karlsruhe Nuclear Research Center using a slide rule, February 1966, photograph of unknown authorship. KIT Archives 28010/16923.

page 203, bottom
Employee of the Karlsruhe Nuclear Research Center using a slide rule, July 4, 1968, photograph of unknown authorship. KIT Archives 28028/02220.

063
page 204
Separating nozzle stage at Karlsruhe Nuclear Research Center, photographer unknown, November 18, 1969, black-and-white negative. KIT Archives 28028/01306.

page 205
Close-up of a separating nozzle, 17.05.1973, photograph of unknown authorship. KIT Archives 28028/03050.

064
page 206
Pennant of the canine unit at Karlsruhe Nuclear Research Center, ca. 1980. KIT Archives 28506/37. Photography: Amadeus Bramsiepe and Jonas Zilius.

065
page 207
Fish knife, ca. 1960. KIT Archives 28506/29. Photography: Amadeus Bramsiepe and Jonas Zilius.

066
page 208, top and bottom
Peter Faulhaber: Deutsches Brüter Ende, 1991. Reproductions of photographs by Ulrike Faulhaber.

067
page 225
Hydrogen test vehicle at Karlsruhe Nuclear Research Center, February 1986, photograph by unknown author. KIT Archives 28028/08139.

page 226
Hydrogen test vehicle at Karlsruhe Nuclear Research Center, February 1986, photograph by unknown author. KIT Archives 28028/08140.

068
page 227
Dispenser box with non-woven wipes, ca. 1970. KIT Archivew 28506/33. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 228
Dispenser box at the Karlsruhe Nuclear Research Center, January 27, 1959, photograph by unknown author. KIT Archives 28028/00467.

069
page 229, top
Micro-gearwheel, photography: Gerhard Schüler, 1986. KIT Archives 28028/19225.

page 229, bottom
Size comparison between a micro tool and an ant, ca. 1990, photograph of unknown authorship. KIT Archives 28028/20884.

070
page 230
Claus Mattheck: The Method of Tension Triangles, 2005. KIT Archives 28010/I 6480.

page 231, top
Claus Mattheck deonstrates the principle of Tension Triangles, photograph of unknown authorship.

page 231, bottom
Claus Mattheck shows the principle of Tension Triangles, photograph of unknown authorship. Copyright: Karlsruhe Institute of Technology.

071
page 232
Virtual Reality Force Feedback Simulator for minimally invasive surgery, ca. 2003. KIT, Institute for Automation and Applied Informatics. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 233, top and bottom
Virtual Reality Force Feedback Simulator for minimally invasive surgery, stills of an animated graphic, ca. 2003, KIT, Institute for Automation and Applied Informatics. Copyright: Karlsruhe Institute of Technology.

072
page 234
Magnetic coil for the confinement of plasma for nuclear fusion, 2000. KIT, North Campus. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 235
Installation of a superconducting test coil in the toroidal coil test arrangement Karlsruhe at the Karlsruhe Research Center, December 15, 2001, photograph of unknown authorship. KIT Archives 28028/13925.

073
page 236
Michelson Interferometer. Deutsches Museum, Munich. Photography: Hubert Czech.

074
page 237, top
Demonstration procession of students in Karlsruhe, January 20, 1970, photography of unknown authorship. KIT Archives 28010/I 8131.

page 237, bottom
UNIVAC 1108 computer, ca. 1970, photography: Rolf Donecker. KIT Archives 28010/I 1035.

075
page 238
Glider AK–1, maiden flight 1971. Deutsches Museum, Munich, Flugwerft Schleißheim. Photography: Deutsches Museum.

076
page 240
Diploma by Karlsruhe University for Jochen Dietrich, January 20, 1971. KIT Archives 21015/7314.

077
page 257
Rope with a hangman's knot, (1979). KIT Archives 28506/17. Photography: Amadeus Bramsiepe and Jonas Zilius.

078
page 258
page 259 (close up)
Email, August 2, 1984. Stadtarchiv Karlsruhe 8 Sts 4 265. Photography: Felix Gross.

079
page 260
Schärfer bitte! Periodical of Fachschaft Maschinenbau/Chemieingenieurwesen, No. 40 (May 1997). KIT Archives 28006/143.

080
page 261
T-shirt, 1997. Private holding. Photography: Amadeus Bramsiepe and Jonas Zilius.

081
page 262
Wooden cross as a protest, 2009. KIT Archives 28506/5. Photography: Amadeus Bramsiepe and Jonas Zilius.

082
page 263, top and bottom
Humanoid robot ARMAR III, 2006. KIT Institute of Anthropomatics and Robotics. Copyright: Karlsruhe Institute of Technology.

083
page 264
International visitors' gifts, ca. 1955–2020. KIT-Archives; KIT Service Unit International Affairs; KIT Office of the President. Photography: Amadeus Bramsiepe and Jonas Zilius.

084
page 266
Cup in original size, carried inside the submersible during the dive to the wreck of the Titanic, date of travel: November 7, 2022. KIT Archives 28506/34. Photography: Amadeus Bramsiepe and Jonas Zilius.

page267
Cup after exposure to water pressure at the wreck of the Titanic, date of travel: November 7, 2022. KIT Archives 28506/34. Photography: Amadeus Bramsiepe and Jonas Zilius.

085
page 268, top and bottom
The vacuum chamber for the main spectrometer of the KATRIN experiment is towed through Eggenstein-Leopoldshafen after delivery on the Rhine, November 25, 2006, photography: Markus Breig. KIT Archives 28010/I 7185.

page 269, top
Working in the vacuum chamber of KATRIN, May 29, 2008, photography: Markus Breig.

page 269, bottom
The vacuum chamber for KATRIN in operation, February 18, 2020, photography: Markus Breig.

086
page 270
KIT backpack, ca. 2015. KIT Archives 28506/26. Photography: Amadeus Bramsiepe and Jonas Zilius.

087
page 271, top and bottom
Karlsruhe high performance computer, 2023. KIT North Campus, Scientific Computing Center. Copyright: Karlsruhe Institute of Technology.

088
page 272
Tam-tam, 2020. Symphony orchestra of the KIT. Photography: Amadeus Bramsiepe and Jonas Zilius.

089
page 289
Mold for high-level radioactive waste, ca. 2000. Kerntechnische Entsorgung Karlsruhe. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 290
Test setup of the pilot vitrification plant at Forschungszentrum Karlsruhe, 1998, photography of unknown authorship. KIT Archives 28028/10876.

090
page 291
Material sample of Celitement cement, ca. 2010. KIT Archives 28506/38. Photography: Amadeus Bramsiepe and Jonas Zilius.

091
page 292
War memorial, 1873. KIT South Campus. Photography: Amadeus Bramsiepe and Jonas Zilius.

092
page 293, top
Print: Festzug der Studirenden des Polytechnikum zu Karlsruhe […], Karlsruhe (1877), here: Department of Mathematics. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 293, bottom
Print: Festzug der Studirenden […], here: Department of Architects, part 1.

page 294, top
Print: Festzug der Studirenden […], here: Department of Chemistry.

page294, bottom
Print: Festzug der Studirenden […], here: Department of Mechanical Engineering.

page 295, top
Print: Festzug der Studirenden […], here: Department of Civil Engineering, part 1.

page 295, bottom
Print: Festzug der Studirenden […], here: Department of Forestry, part 1.

093
page 296
Sculpture of Pallas Athena, 1925. KIT South Campus. Photography: Amadeus Bramsiepe and Jonas Zilius.

094
page 297
Plaque in memory of Hans Bunte, presumably 1932. KIT, Engler Bunte Institute. Photography: Amadeus Bramsiepe and Jonas Zilius.

095
page 298
Plaque for the appreciation of ammonia synthesis, 1990. KIT Archives 28502/38. Photography: Amadeus Bramsiepe and Jonas Zilius.

page 299
The protest plaque at the ammonia synthesis reactor together with the plaque honoring ammonia synthesis at the junction of Fritz-Haber-Weg and Engesserstraße, J une 13, 1991, photography by unknown author. KIT Archives 28010/I 1094.

096
page 300
Protest plaque against chemical weapons, presumably 1990–1991. KIT Archives 28502/37. Photography: Amadeus Bramsiepe and Jonas Zilius.

097
page 301
Memorial plaque for the research reactor 2, ca. 1995. Kerntechnische Entsorgung Karlsruhe. Photography: Amadeus Bramsiepe and Jonas Zilius.

098
page 302
Monument to Carl Benz, 2007. KIT South Campus. Photography: Amadeus Bramsiepe and Jonas Zilius.

099
page 303
Memorial plaque to the victims of National Socialism, 2016. KIT South Campus. Copyright: Karlsruhe Institute of Technology.

100
page 304
The loo reading, January 2022, No. 1. KIT Archives 28005/146.

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Klaus Nippert (curator),
Andrea Stengel (curator),
Jonas Zilius (creative direction)

Karlsruhe, April 2025

Klaus Nippert studied history and philology and subsequently earned his doctorate with a thesis on the early modern history of Lower Saxony. After a traineeship for the higher civil service in archives, he took over as head of the Karlsruhe University Archives in 2002, which became the KIT Archives in 2009. Klaus Nippert is the author of publications in the fields of history, archival science, and literary studies.

Andrea Stengel studied art history, English, and education. Since 2009, she has been curator of the art collection at KIT in the Planning and Construction organizational unit and oversees art in architecture projects. Andrea Stengel's other professional positions include the Deutsche Bank Collection in Frankfurt, the Film Museum in Frankfurt, and the Haus der Geschichte Foundation in Bonn.

Jonas Zilius studied architecture and media art. From 2017 to 2020, he was a lecturer in “Image Production” at the Karlsruhe University of Arts and Design. Jonas Zilius is currently departement head of Campus Services – Media Production at KIT. In his work as a photographer and artist, he explores questions about objects and artifacts and their detailed observation and visual reproduction, mostly based on long-term research in scientific and historical context.

Amadeus Bramsiepe trained as a photographer and has been working in the Campus Services - Media Production department at KIT since 2018. His focus is on industrial and corporate photography. As a freelance photographer, Amadeus Bramsiepe works for institutions and companies in the Karlsruhe region and throughout Germany.

Christoph Engel studied photography and typography. He is a freelance photographer and book designer since 2006 and a lecturer in photography and book design at the Faculty of Architecture at KIT, since 2015 also at the Professorship for Fine Arts. From 2009 to 2016, he was a lecturer in book design in the photography course at the Folkwang University of Arts in Essen. In his photography, he explores the landscape and the human traces in it; in design, he explores the medium of the book and its principles and develops visual concepts.

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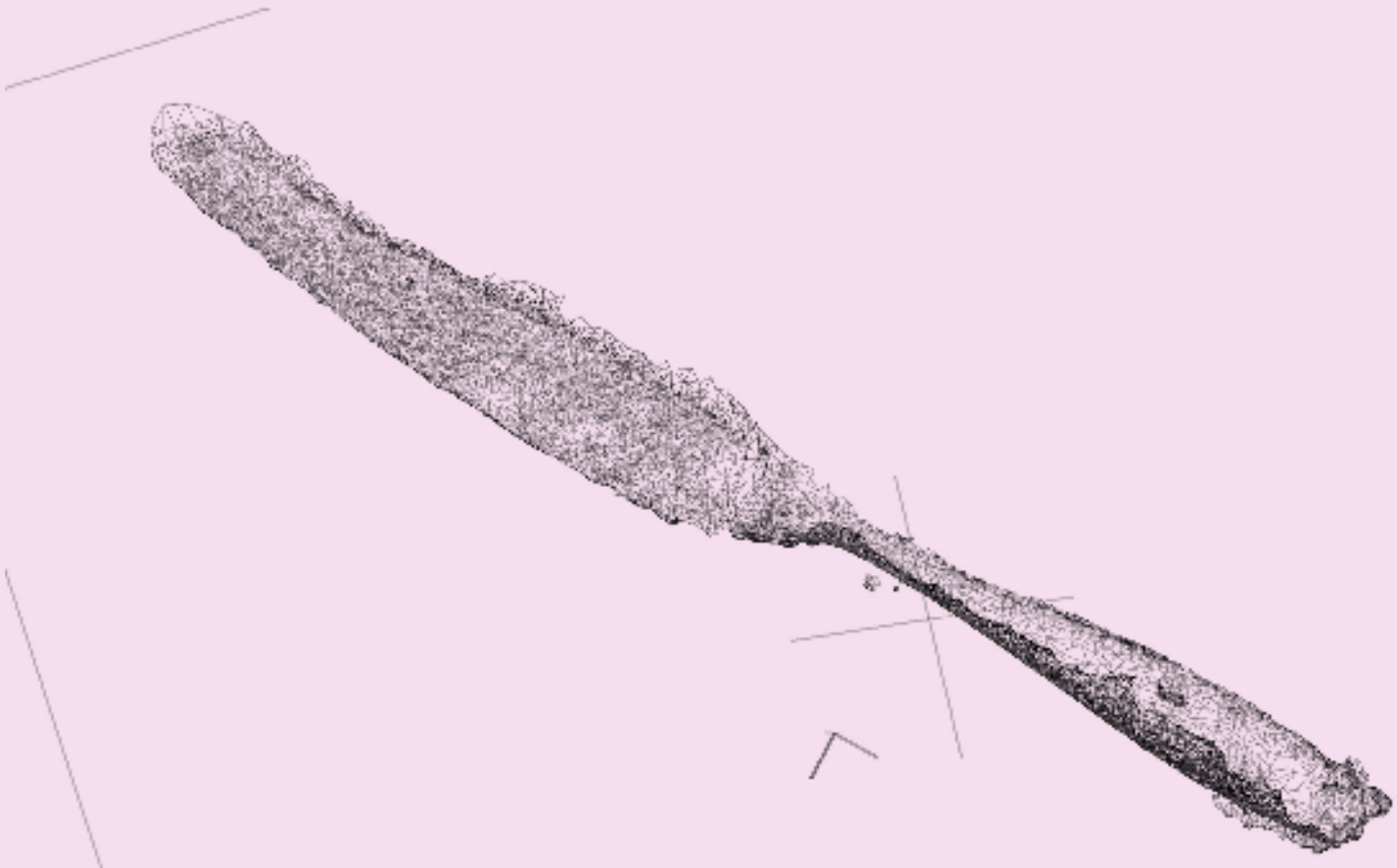
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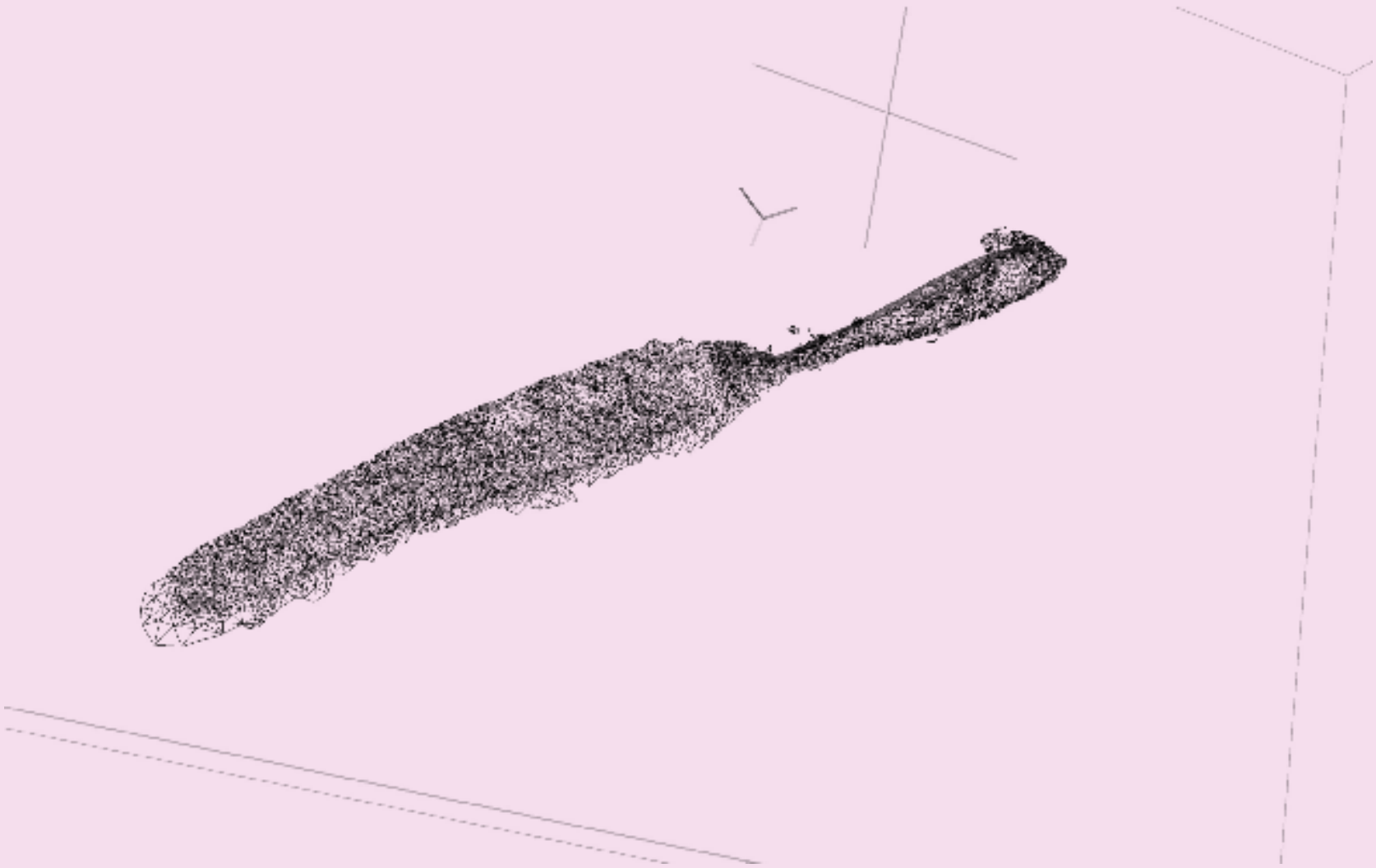




039 Table Knife from the Refectory ca. 1930

← p.244





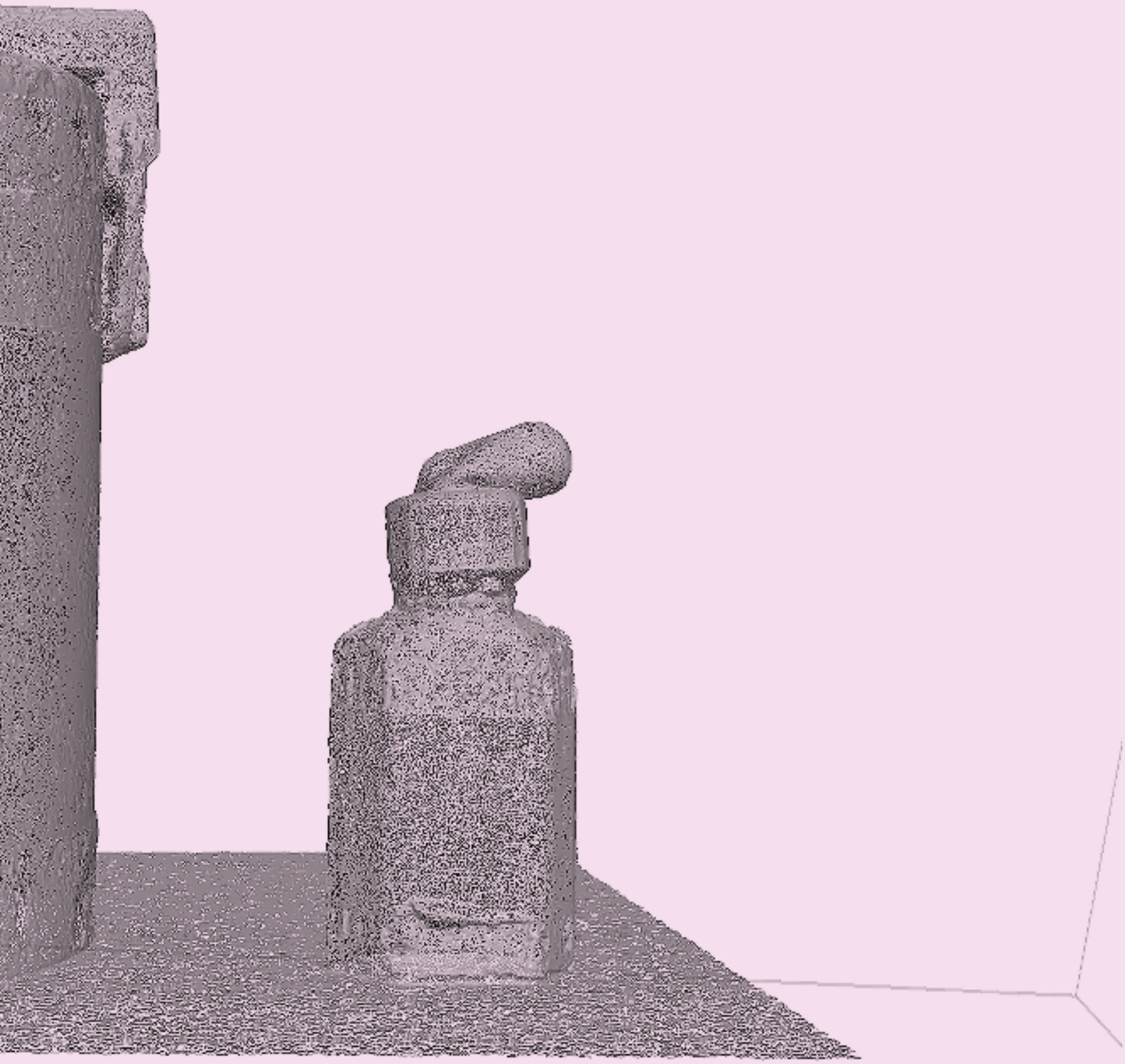
3D-Scans, 2025

048

Instrument for Measuring Carbon Dioxide Content in Room Air 1943



← p.250



3D-Scans, 2025

048

Instrument for Measuring Carbon Dioxide Content in Room Air 1943



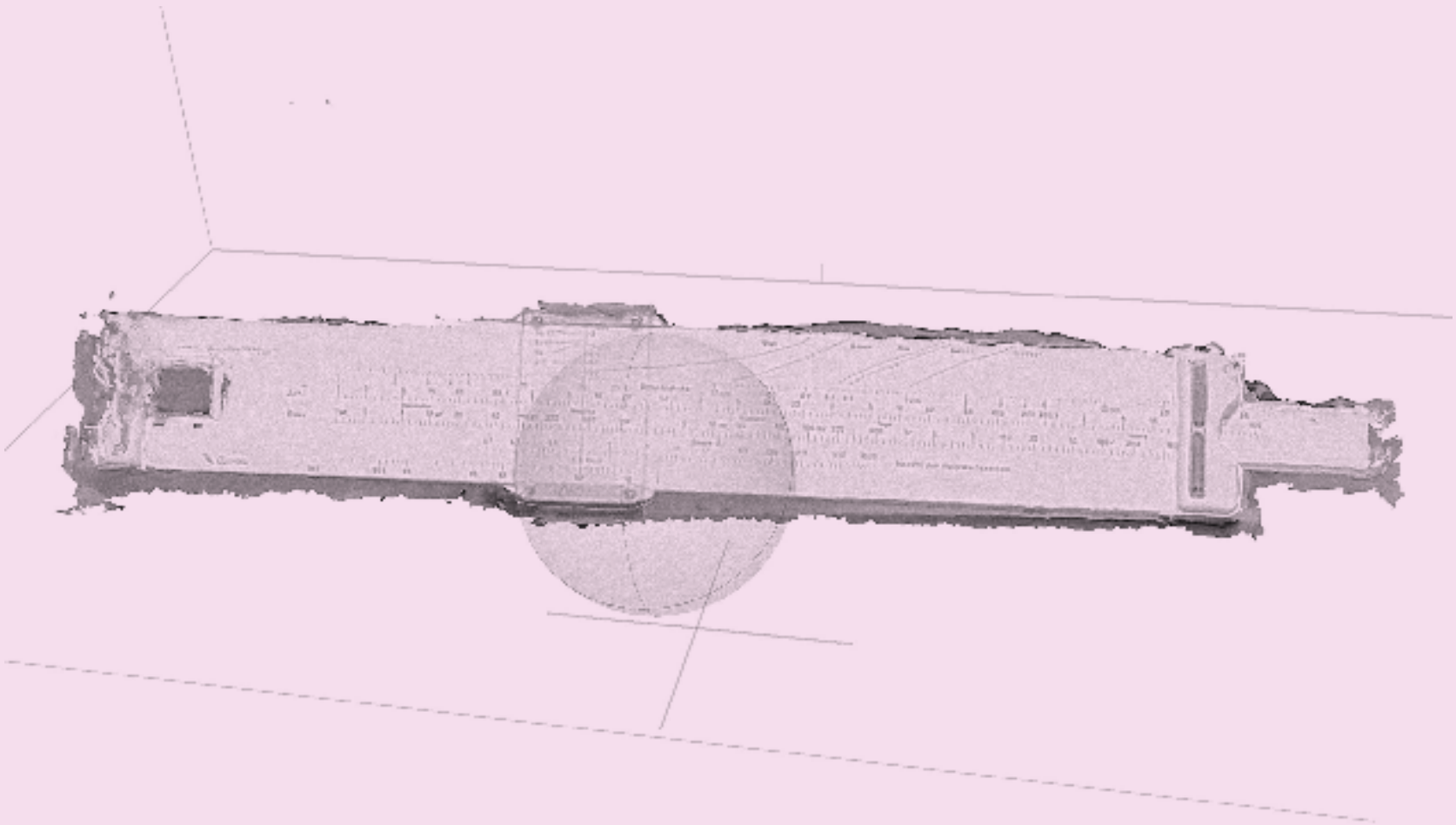
← p.250

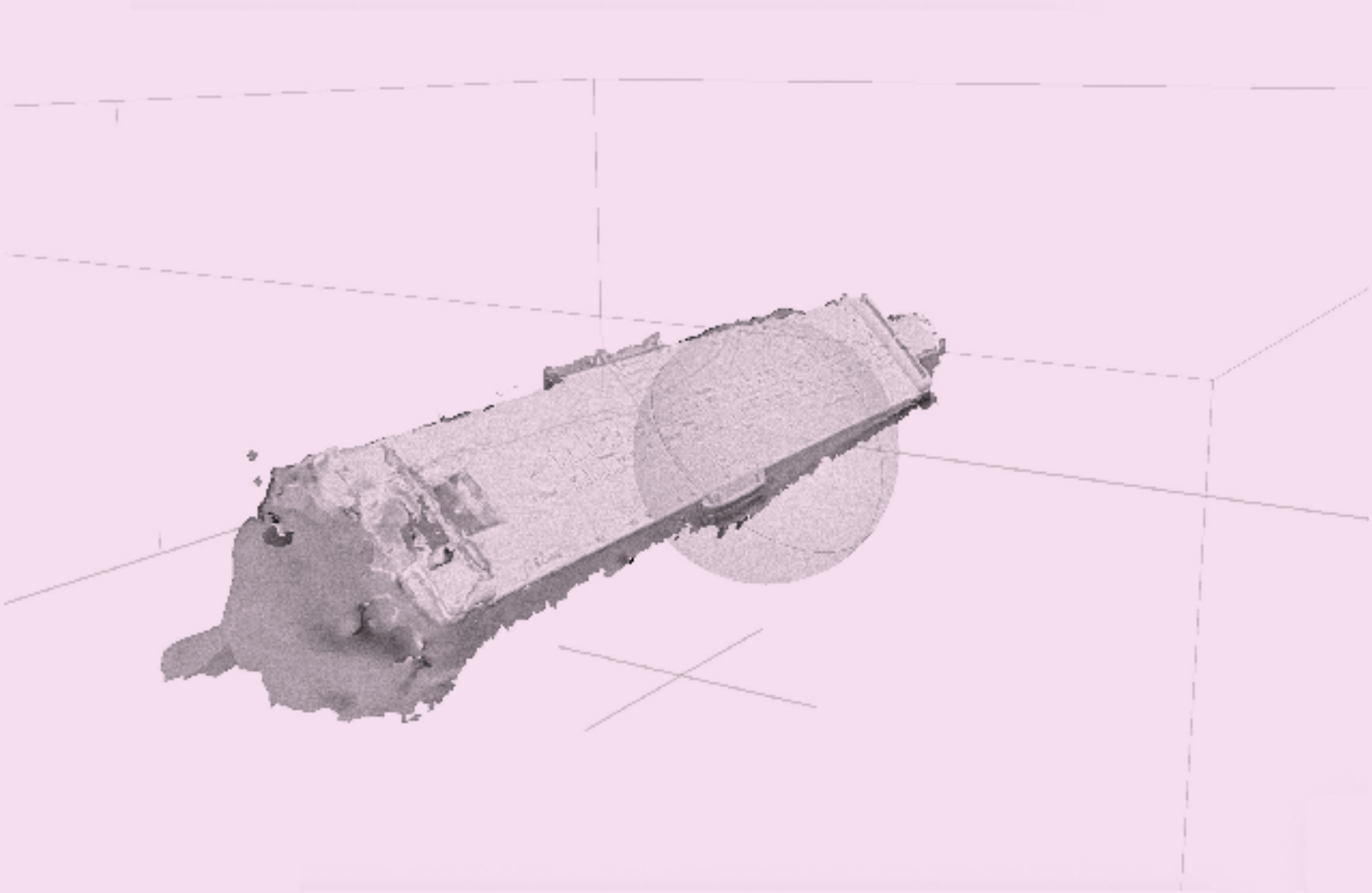


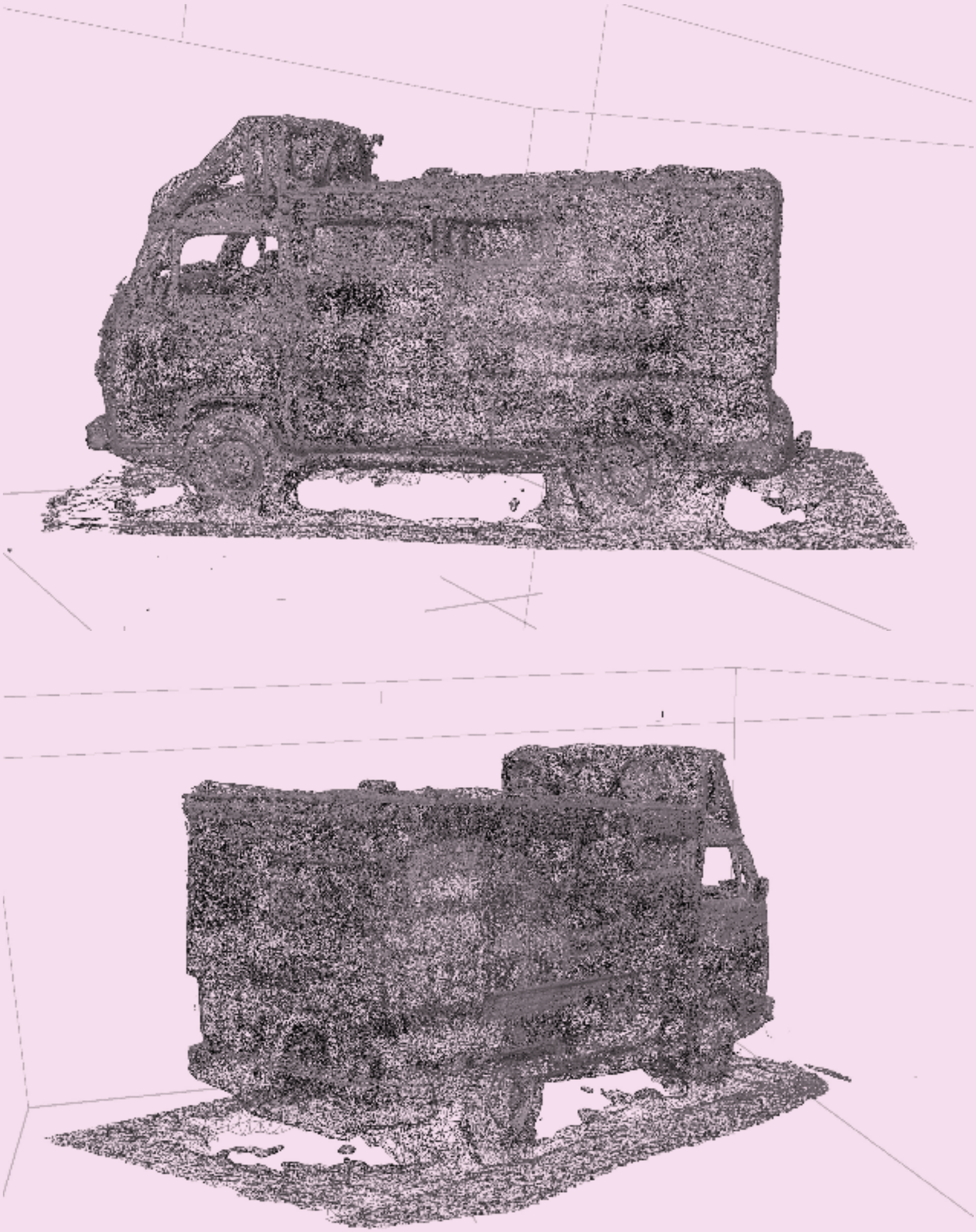
3D-Scans, 2025

Radiation-Protection Slide Rule 1958

← p.279





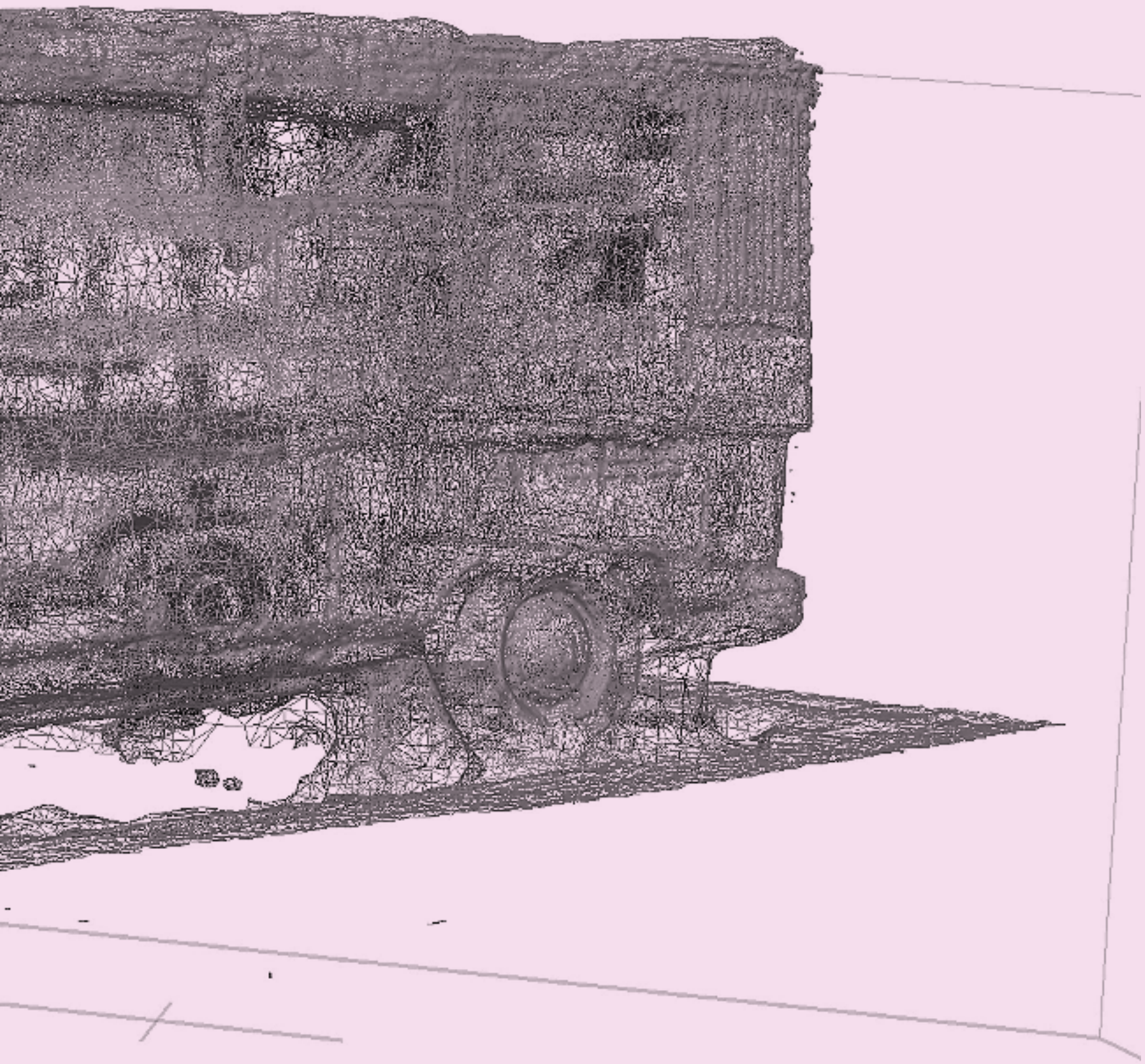


3D-Scans, 2025

067 Hydrogen Automobile 1986



← p.281



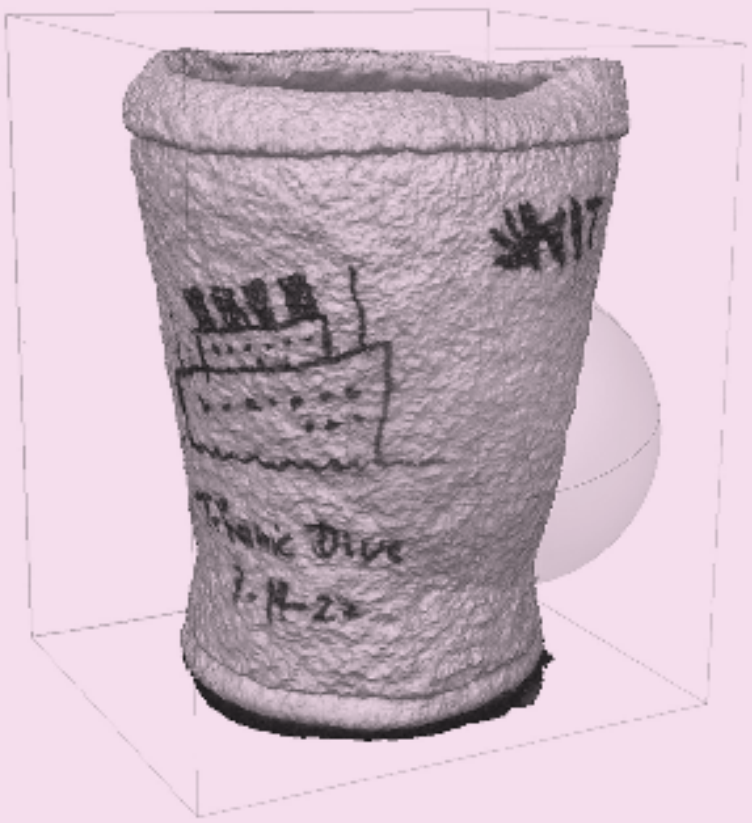
3D-Scans, 2025

084

Drinking Cup of a Traveling Researcher 2022



← p.310



3D-Scans, 2025

Climate-friendly Cement 2010

← p.313



Pallas Athena 1925

← p.316



3D-Scans, 2025

093 Pallas Athena 1925





350

← p.316



3D-Scans, 2025

093 Pallas Athena 1925

← p.316

