FOSTERING OPEN SCIENCE AT FRAUNHOFER

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AGENDA

- Fraunhofer Facts & Figures
- The academic side – university relations, education, dissemination
- The RTO side – applied research, industry relations and IP
- Introducing a CRIS – corporate responsibility and scientific integrity
- The Open Science journey – policies, infrastructure, accompanying research
- Conclusions
Josef von Fraunhofer (1787 – 1826)

- **Researcher**
  Discovery of “Fraunhofer Lines” fundamentals in optics & spectral analysis

- **Inventor**
  New methods of lens processing

- **Entrepreneur**
  Head of royal glass factory

Fraunhofer Lines: absorption lines in the solar atmosphere caused by chemical elements
Fraunhofer today at a glance

25,327 staff

72 institutes and research units

Finance volume

- €2.3 billion
- €2.0 billion

Contract Research

2017

Major infrastructure capital expenditure and defense research

Almost 30% is contributed by the German federal and states Governments

More than 70% is derived from contracts with industry and from publicly financed research projects.
Fraunhofer worldwide
## Fraunhofer research networks

### Innovation Research
- IAO, IMW, INT, IRB, ISI

### Microelectronics
- EMFT, ENAS, FHR, HHI, IAF, IIS, IISB, IMS, IPMS, ISIT, IZM
- Guests: AISEC, ESK, FOKUS, IDMT, IKTS, IMWS, IZFP

### Information and Communication Technology
- AISEC, ESK, FIT, FKIE, FOKUS, IAIS, IDMT, IESE, IGD, IOSB, ISST, ITWM, IVI, MEVIS, SCAI, SIT
- Guests: HHI, IIS, IAO

### Production
- IAPT, IEM, IFF, IGCV, IGP, IML, IPA, IPK, IPT, IWU, UMSICHT

### Life Sciences
- EMB, IBMT, IGB, IME, ITEM, IVV, IZI

### Defense and Security
- EMI, FHR, FKIE, IAF, ICT, INT, IOSB
- Guests: HHI, IIS, ISI

### Light & Surfaces
- FEP, ILT, IOF, IPM, IST, IWS

### Materials and Components – MATERIALS
- EMI, IAP, IBP, ICT, IEE, IFAM, IKTS, IMM, IMWS, ISC, ISE, IWES, IWM, IZFP, LBF, WKI
- Guests: IGB, IIS, ISI, ITWM

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[1]
FRAUNHOFER’s ACADEMIC SIDE

Academic research structures

- Extensive interrelations with Universities
- 80 Fraunhofer Directors hold chairs at universities
- Direct involvement into academic lecture content
- Fraunhofer Institutes offer PhDs
  - 2016 > 2053 dissertations, 2853 ongoing
- x72: all institutes have own library and personnel (scientific information manager)
- x1: central institutional repository, library and publication support services (at IRB)
FRAUNHOFER’s ACADEMIC SIDE

Academic research structures

Scopus
Academic research structures

Number and Increase of Titles in Publica
(Year of Acquisition)

Referenced scientific publications vs.
non-referenced scientific publications at Fraunhofer

Extrapolated: Scientific publications in Fraunhofer-Publica (referenced in WoS a/o Scopus)
Scientific publications in Fraunhofer-Publica (referenced in WoS a/o Scopus)
Extrapolated: Dissertations
Dissertations
Extrapolated: Scientific publications in Fraunhofer-Publica (not referenced in WoS a/o Scopus)
Scientific publications in Fraunhofer-Publica (not referenced in WoS a/o Scopus)
Academic research structures

Research Process at Fraunhofer

- idea project proposal
- discovery of information
- data results inventions
- publication patent

library & information management

dissemination management

Scientists

Industry / Market the Public
FRAUNHOFER’s RTO SIDE
Research and Technology Organisations of Europe (EARTO)
FRAUNHOFER’s RTO SIDE

Patenting, IP and industry relations

- RTOs are bridging the gap between basic research and market
  2017: 11,000 projects of applied research with industry partners (7,500 with public funders)
- RTO Mission is about adapting inventions to industry use and to innovations
  Among »Top 100 Global Innovators« (3 other German companies: BASF, Bayer, Merck)*2
- Collaborations with industry mostly confidential, exploitation interests
- Different Stakeholders and their requirements: Industry, Science, Society, Politics
- Tension field between open and closing –
  high obligation to succeed economically and innovate with industry,
  vs. transferring knowledge to society, politics and science

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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</thead>
<tbody>
<tr>
<td>Active patent families at year end*</td>
<td>6573</td>
<td>6762</td>
<td>7036</td>
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<tr>
<td>Invention disclosures reports per year</td>
<td>670</td>
<td>798</td>
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<tr>
<td>Patent applications per year</td>
<td>506</td>
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* Portfolio of active rights (patents and utility models) and patent applications at year end.
*2 Clarivate Analytics, 2017 [2]
FRAUNHOFER’s RTO SIDE

RTO view of recent strategic research areas

Orientation and topic development

Research networks and initiated projects

Longterm exploitation

Readiness

Translational Medicine

Public Security

Cognitive Systems/Data Sovereignty

Battery Technology

Programmable Materials

Quantum Technology

Biologic Transformation

Incubator (Technology Intelligence Process)
Benefits of opening research for RTOs and its stakeholders

- **SCIENCE**
  Contributing to scientific communities, accelerating scientific progress, claiming scientific results

- **INDUSTRY**
  Input for open innovation processes – shorten innovation cycles

- **SOCIETY**
  Transfer of scientific results to society, create participation opportunities, societal engagement

- **POLITICS**
  Support agenda setting processes through scientific knowledge

- **FUNDERS**
  Compliance with open strategies and requirements

- **ECONOMY**
  Fostering economic progress
Vision for Open Science at Fraunhofer

- efficient knowledge transfer
- shorter innovation cycles
- accelerate scientific progress
- interdisciplinary reuse
- new business models
- democratisation of knowledge
- transparency of science
- enhance research quality
- ensure research integrity
INRODUCING A CRIS

Motivators & Goal setting

- Fraunhofer-Modell: complex benchmark system in place but so far “freedom of science”
- Corporate responsibility: safeguarding scientific integrity
  Company directive scientific integrity | Ombudsman in every institute | ethics commission
- Since 2012 implementation of a measuring system scientific indicators = CRIS
  enable comparability | introduce new collection process | analyze research processes

SCIENTIFIC INDICATORS

- SCIENTIFIC OUTPUT:
  Scientific publications, intern. co-publications, citations/excellence rates, patents
- ACADEMIC QUALIFICATION
  Doctoral theses, master theses
- SCHOLARLY ACKNOWLEDGEMENT & ACADEMIC NETWORKING
  High-level awards, spokesmanships, projects of excellence
Implementation process

- Structure follows strategy: CRIS tool & software came late in the project
- DSpace-CRIS was selected and is implemented with external support
  5 pilot institutes response to data validation, data collection and support requirements
- More technical info on DINI-FIS-Blog: „DSpace-CRIS @ Fraunhofer“ [3]
  http://blogs.tib.eu/wp/fis (German only)
Accompanying factors and effects of a CRIS - our findings so far

- Have corporate responsibility be the driver, not infrastructure governance
  make compromises to data collection processes rather than scientific integrity

- Academic administrative data are very heterogeneous and difficult to collect
  all data should be standardized | embrace initiatives like <cerif> and KDSF [4]

- Our existing ERP systems are long standing, vast and highly regulated
  CRIS implementation needs to compromise and accept a slow BI-adaptation process

- Does CRIS implementation invite long-term socio-scientific aspects?
  Are we creating a self referential system or a structure for linear process improvement?
  - We notice a higher attention to valid publication data and processes
  - Authors start to look more into their academic profile and want to perfect it
  - Endanger freedom of science: scientists may begin to feel patronized and controlled
  - Would a merit system positively support the scientific indicators?
OPEN SCIENCE JOURNEY

Open Access

- 2003: among first signatories of Berlin declaration
  early phase of information and community engagement, stakeholder assessment...

  DINI-certificate, first steps of an Open Access infrastructure, communication concept...

- 2009: Open Access Policy, introduction of a central support team
  Company wide wiki, brochures, information talks & workshops, congresses...

- 2012: Extended publication support, deposit workflows, community engagement
  H2020, OA-publication analysis (top ten journals per institute)...

- 2015: Open Access Strategy and Goals: 2020->50% OA, OA Rate is reported to Ministry
  publication process as a business process, dissemination strategies... [6]

- 2018: Consolidation of OA-management, own OA-research projects
  project „OA-Transformation“, central publication fund, ORCID, Open APC...[7]
Open Access development

www.openaccess.fraunhofer.de
Open Access development

### Open and Closed Publication Output at Fraunhofer

<table>
<thead>
<tr>
<th>Year</th>
<th>Closed publications (no patents)</th>
<th>Extrapolated: Closed publications (no patents)</th>
<th>Open access green</th>
<th>Extrapolated: Open access green</th>
<th>Open access gold</th>
<th>Extrapolated: Open access gold</th>
<th>Open access gold (estimated)</th>
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### Open Access Publications Scientific

(Referenced in WoS a/o Scopus)

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<th>Year</th>
<th>Scientific open access green</th>
<th>Extrapolated: Open access green</th>
<th>Scientific open access gold</th>
<th>Extrapolated: Scientific open access gold</th>
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<td>2006</td>
<td>7</td>
<td>0</td>
<td>0</td>
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</table>
Open Data

- 2014: H2020 Open data pilot | DFG Guidelines on the Handling of Research Data [8]: infrastructure expansion plan, information and community engagement...

- 2015: Evaluation project research data management FODRATIS concept and internal fundraising...

- 2016: FORDATIS project gets a go along with H2020 Research Project JERRI information & support structures, first aid kit DMP, Fraunhofer wide survey [9] …

- 2017: Extended publication support, deposit workflows, community engagement Implementation preparations for expansion of repository infrastructure...

- 2018: Information workshops and training on research data management DSpace Implementation ongoing, JERRI results will help with institutionalization…
## Open Data

### Data Management Plan

<table>
<thead>
<tr>
<th>Allgemeine Informationen</th>
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<tbody>
<tr>
<td>Projektnummer:</td>
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<tr>
<td>Projekt-ID:</td>
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<tr>
<td>Kontakt/ Koordination:</td>
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<tr>
<td>Kontakt:</td>
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<tr>
<td>Förderer (z.B. OAFD):</td>
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### Datenansatzname und -referenzen:

- Folgende Datensätze werden im Rahmen des Projektes neu erstellt:
  - mit der ID
  - mit der ID

- Grund für die Neuerstellung:

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**Support for the preparation of Data Management Plans for projects of the FÖ Studying programme “FORDATIS”**

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**FORDATIS - Speicherraum für Fraunhofer-Forschungsdaten**

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**FORDATIS APPLICATION PROFILE**

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**Wie bleiben Daten für lange Zeit verfügbar?**
Fraunhofer Open Science Infrastructure

INPUT

Library Services @ Fraunhofer
- eLib: discovery resolving
- OPAC: library information systems

Fraunhofer Publishing House
- Books, ebooks: editing, printing, distributing

Livecycle & Processes
1. controlling
2. collection
3. curation

Deposit & Submission
- FIS: research data
- CRIS: scientific indicators
- ERP: administrative data

Fraunhofer Dataspase
- Deposit & Submission: aided, automated, authorized

DSpace farm
- Validation, enrichment, standardisation
- Publica: bibliography, patents
- ePrints: Open Access full texts
- Fordatis: Open Data data sets

Fraunhofer virtual private cloud
- Reports: analysis, validation

Distribution & Marketing
- Books, ebooks
- Reports & Analysis
- Fraunhofer websites

Exploitation & Impact
- Innovation, commercialization, societal impact

Output

Fraunhofer Open Science Space
- FAIR
- Search / discover scientific results

Fraunhofer Open Science Infrastructure
- Google
- BASE
- OpenAIRE
Open Science as a research topic

- 2017: new Fraunhofer Group for Innovation Research socioeconomic and sociotechnical research, providing guidance to decision-makers in politics and industry [10]

- JERRI (H2020 Project): www.jerri-project.eu (together with TNO) aims to contribute to deeply institutionalizing practices and attitudes of Responsible Research and Innovation (RRI) in 5 key dimensions (dimension 3: Open Access / Open Data), focus on RTOs needs extensive reports on our deliverables online [10]

- HEFE Project (funded by German Ministry of Education and Research) aims to develop data governance for analytic, planning and real time data

- Citizen Sensor (funded by German Ministry of Education and Research) aims to develop a white book of citizen science [11]
Development areas and accompanying research disciplines

- stakeholder involvement
- integrated licensing models
- Cultural Change
  - legal framework
  - participation opportunities
  - usage of open knowledge
- Research Topics
  - data driven business models
  - co-operation models
  - technical requirements
- competence development
- computer science
- library information science
- communication science
- science of science
- sociology
- economics
- legal norms
- bibliometrics
- psychology
- Political science
CONCLUSIONS

- RTOs have very specific needs and perspectives to implement Open Science. The benefits start to become clearer but the change at RTOs is just beginning. Our Motto will be: „AS OPEN AS POSSIBLE AND AS CLOSED AS NECESSARY!“

- Our academic side pushes us to quickly realize Open Science with infrastructure uptake, the process will accelerate even more.

- Open Access and Open Data mechanics are not yet fully understood by our scientists. We need to start over explaining and not cease to explain and support our scientists.

- The need for research intelligence information to support management is growing. CRIS systems have multiple uses, can aid both CR, BI and research marketing.

- Open Science development is too scattered and lacks overall plan. Many local initiatives, no central steering, no true stakeholder engagement.

- Open Science merit system is missing but would help (OA rate per institute, author, …). The scholarly world is still running on the old merit system (bibliometric factors).
CONTACT

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THANK YOU!
Tack så mycket!
Danke!
References

  https://openapc.github.io/general/openapc/2018/05/23/fraunhofer/