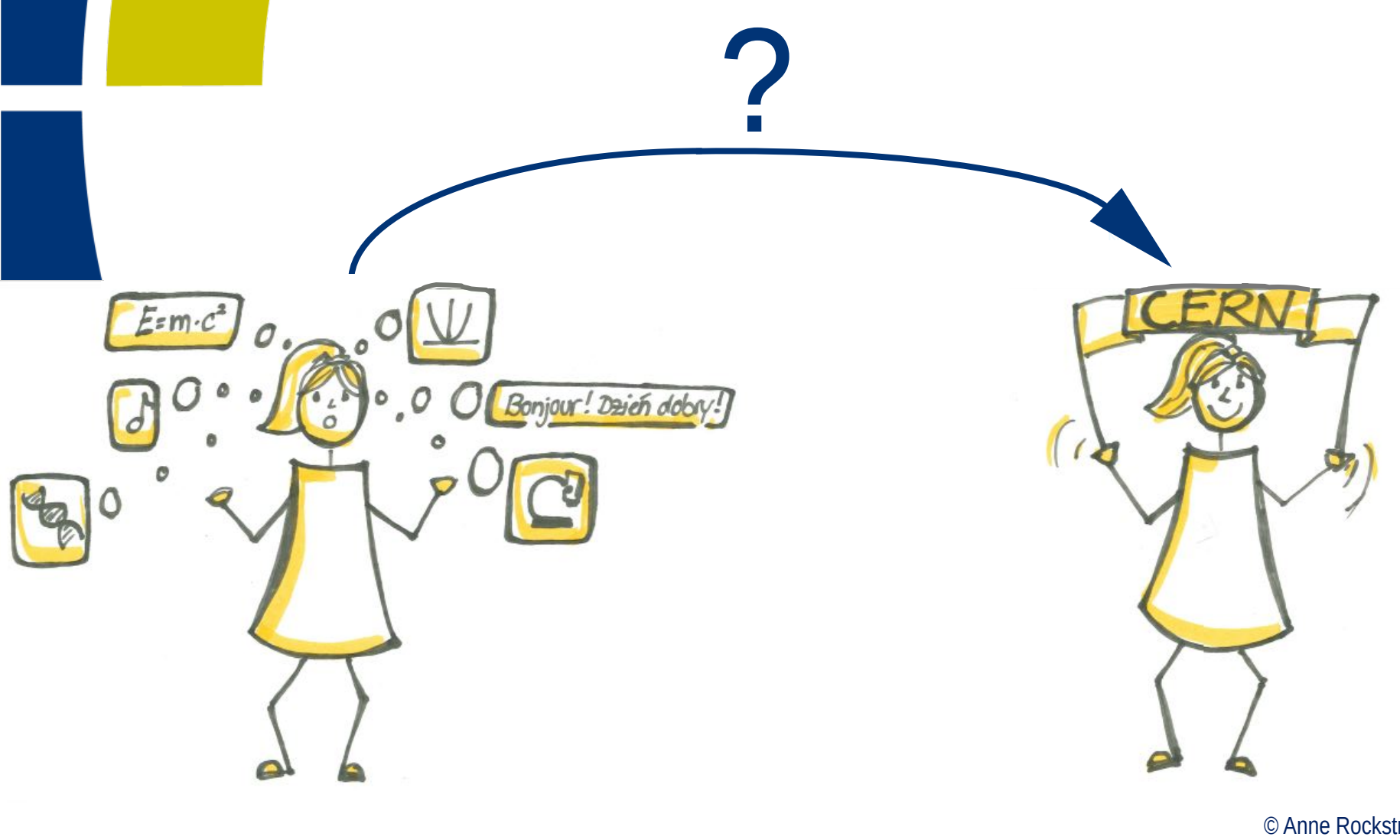
Netzwerk Teilchenwelt

Where High School Students Participate in HEP Research and Young Talents are Promoted

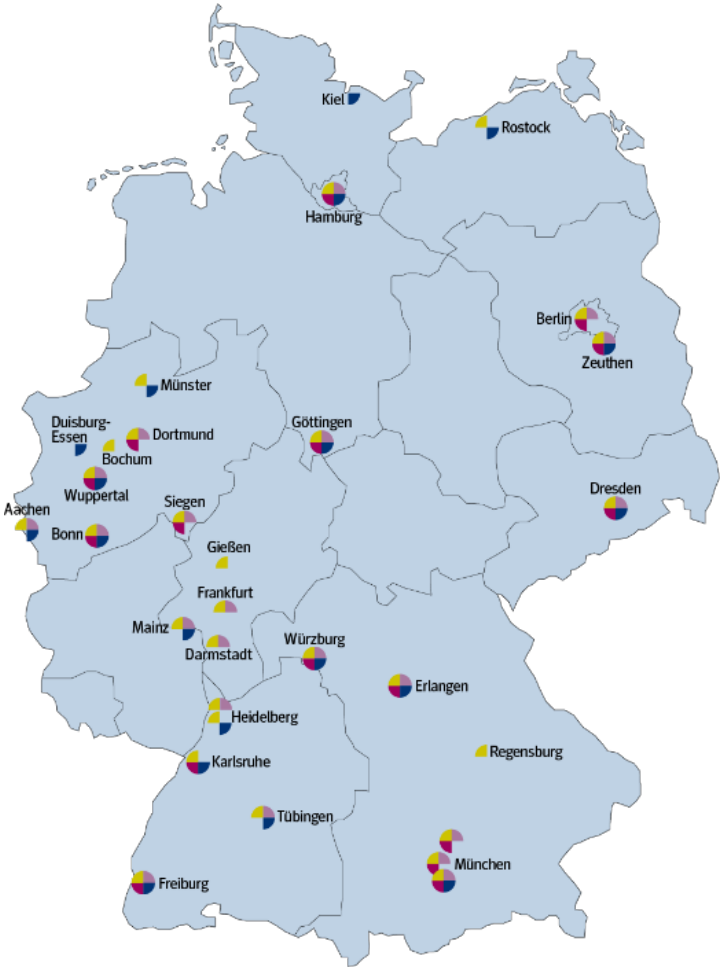
NETZWERK TEILCHENWELT



© Anne Rockstroh

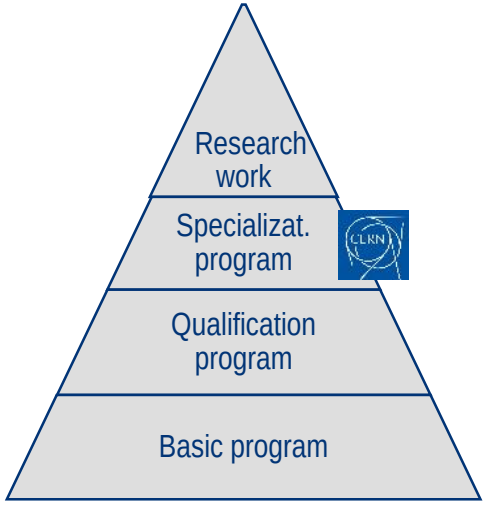
Netzwerk Teilchenwelt

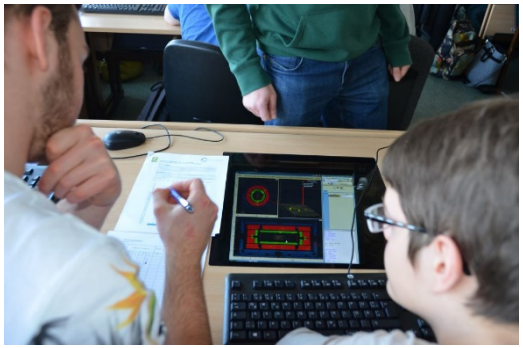
- High school students (15-19 y.)
  - experience HEP research
  - participate in HEP research
- 30 universities/research labs + CERN
- Project team
  - TU Dresden
  - DESY at Zeuthen
  - CERN
- started in 2010



Netzwerk Teilchenwelt

- Multi-stage program
- per year working with original HEP data and/or particle detectors
  - 3600 high school students
  - 350 in advanced levels
  - 60 at CERN workshops
  - 15 research projects at CERN or research labs



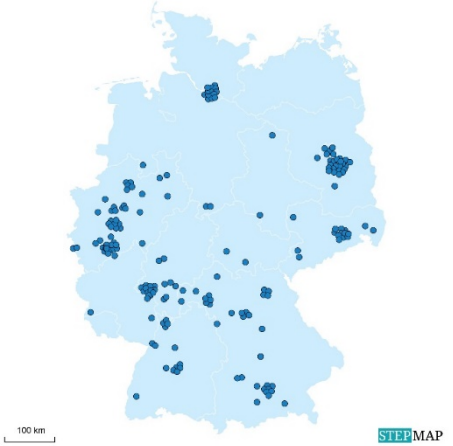


Offers for High School Students

www.teilchenwelt.de/mitmachen/jugendliche

Basic program: Masterclasses

- 1-day-activities, concept:
  - High school students are „scientists for one day“
  - Introductory talks (standard model, detectors, accelerators)
  - Hands-on: measurement with real data
  - Tasks: identify events, create histograms
  - Optional: video conference
- Particle and Astroparticle Physics
- at schools, school labs, museums etc.
- ~ 140 Masterclasses per year



Masterclasses 2018

Offers for High School Students

www.teilchenwelt.de/mitmachen/jugendliche

Basic program

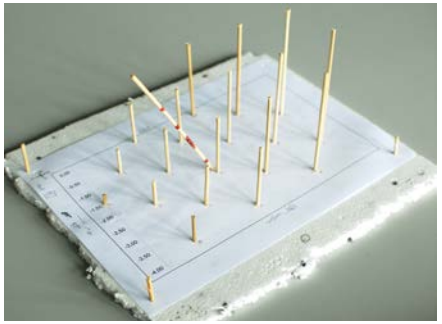
- LHC Masterclasses ATLAS, CMS, LHCb, ALICE, ALICE
- Pierre-Auger Masterclass
- IceCube Masterclass
- NEW: Hadron Therapy Masterclass
  - From GSI and DKFZ
- Each research lab/university focuses on their experiments and activities

ATLAS
- W path (W^+/W^- + H→WW)
- Z path (Z, Z', …)

CMS
- J/Ψ data quality
- W,Z,H analysis

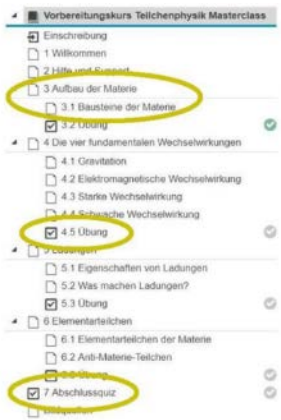
ALICE
- Strange Particles
- Modification Factor R_{AA}

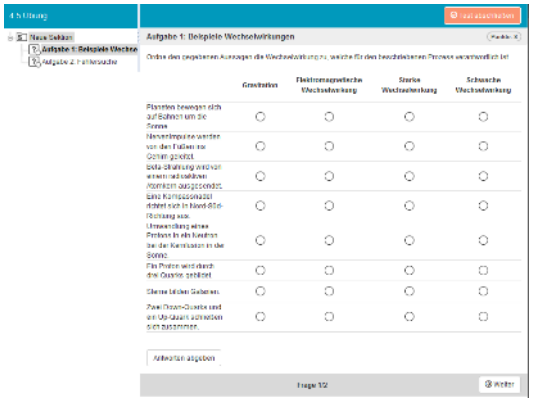
LHCb
- Charm lifetime

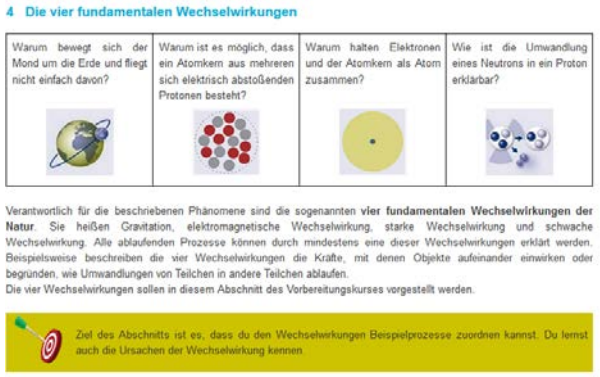


NEW: Online Preparatory Course for LHC Masterclasses

- Introduction to charges, interactions and particles
- Info texts, animations, exercises
- requires 60-90 min
- Teacher theses from Carolin Diesel, TU Dresden 2018
- Evaluation: very good results







Cosmic@Web

http://cosmicatweb.desy.de

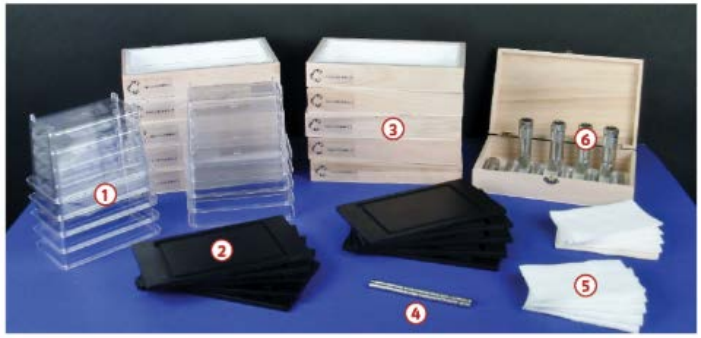
- web platform
- Data sets from 9 experiments, incl. From research vessel Polarstern and Neumayer Station
- Free scientific work
- Learning at various stages
  - Basic knowledge, experiment description, operating instructions, glossary, literature
- 2 working modes: standard and extended

More Offers

www.teilchenwelt.de/mitmachen/jugendliche

Basic program

- Own measurements with particle detectors
  - Scintillation counter (CosMO)
  - Cherenkov counter (Kamiokannen)
  - Various research tasks: Detector understanding, investigation of physical phenomena
- Cloud chamber sets for classrooms



Advanced program: CERN and reseach work

- High school students are brought into contact with research at qualification levels
- 60 students in two annual workshops (4 days) https://indico.cern.ch/event/762375/
- 10 students in project weeks (2 weeks) https://indico.cern.ch/event/775569/
  - own research projects, e.g. Medipix detector, CLOUD, ATLAS trigger system, lifetime of the B-meson, search for supersymmetry and dark matter, NA62, CP violation, beam simulation…
  - Often prize-winning

jugend forscht
Wir fördern Talente.

Dr. Hans Riegel-FACHPREISE

VON ARDENNE

Young Scientists as Key Players

- ~ 180 Facilitators (Vermittler/innen)
- PhD and Master students
- Guiding Masterclasses
- Supervision of student research projects
- Reimbursement of expenses + travel costs
- 2-day advanced training in science communication, didactics, and presentation techniques
- Practice in communication techniques as a "soft skill" for own career

Promoting Young Talents through the Fellow Program

- Alumni of NTW, mainly alumni of CERN workshops
  - Now often studying physics or shortly before that
  - Interested in particle and astroparticle physics
- Fellow program launched in 2017
- Currently about 160 people
- Aim: increase connection with local research groups

Fellow Meeting 2017 Hamburg

Fellow Meeting 2018 Dresden

Offers for Fellows

Local offers

- Invitation to lectures, seminars, excursions etc.
- Internships
- Regulars table (Stammtisch)
- Participation in scientific and outreach activities
- Mentoring
- …

Central coordinated offers

- Fellow Meeting
- Fellow/Bachelor Physics School (March 2019)
- Soft Skill Workshops (Science Communication, Didactics)
- Participation in conferences, FSP meetings…

Fellow Meeting 2019 Mainz

Outreach activity 2019 Berlin

Fellow Meeting 2019 Mainz


Arnold Sommerfeld
$\alpha = \frac{e^2}{\hbar c}$
WISSEN SCHAFFT
Vielfalt

Win-win-Situation

- Research labs
  - Highly motivated students interested in particle physics as future members of the research groups
  - Support for scientific activities (SHK, conferences)
  - Support for outreach activities (Long Night of Science, exhibitions, Open Day, Masterclasses, etc.)
- Fellows
  - Close connection to research groups
  - Further technical training, e.g. Fellow Physics School in March 2019
  - Networking beyond local university

TeVPA Conference 2018 Berlin

Dark Matter Day 2017 RWTH Aachen

FCC Week 2017 Berlin

Teachers as multipliers

- Development of material
  - Teaching material for schools (4 volumes)
    www.teilchenwelt.de/tp
  - Portal Leifi Physik: Chapter on particle physics
    www.leifiphysik.de/themenbereiche/teilchenphysik
  - Particle profile cards
  - Context material
  - > 100 detectors for Cosmic Ray measurements
  - DIY Cloud Chamber sets
  - GeoGebra Analysis of Bubble Chamber images

Teacher Training

Teacher training at universities and research labs, e.g. KIT, DESY …

Forschung trifft Schule
funded by:

DR. HANS RIEGEL-STIFTUNG

- 2-day training for teachers
  - Introduction to particle physics, 6 trainings p.a.
- Summer School at CERN
  - 6 days, once per year

www.teilchenwelt.de/angebote/lehrerfortbildungen-forschung-trifft-schule/

KONTAKT

KOmmunikation, Nachwuchsgewinnung und Teilhabe der Allgemeinheit an Erkenntnissen auf dem Gebiet der Kleinsten Teilchen (2019 – 2021)

- Build on existing structures **Netzwerk Teilchenwelt** + **Weltmaschine**
- Extend frameworks and programs
- Intensify cooperation with other professional players in the areas of communication, participation, recruitment of new talents
- Reach out to other target groups
- More topics/contents from other fields of physics of the smallest particles
- Funded as **integral part of research** within the German research framework program ErUM: Exploration of the Universe and Matter

Weltmaschine

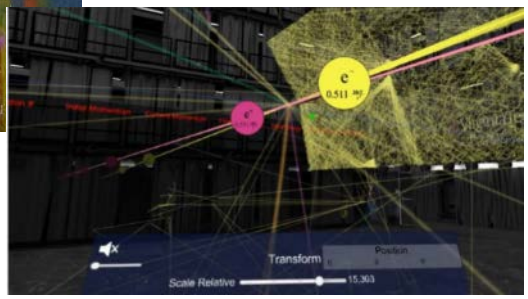
www.weltmaschine.de

- Central information point for the public and media since 2008
- Excellent contact to the press
  - Press material, media library
  - Facts and figures
- Central event organization
  - Journalist Days, Press Spokesperson Day
  - Tag der Weltmaschine
  - Media training for scientists
- Mobile exhibition
  - Shown in 43 research labs

KONTAKT Work Packages 1 - 3

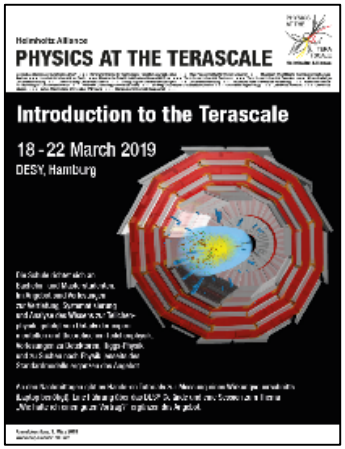
→ General Public

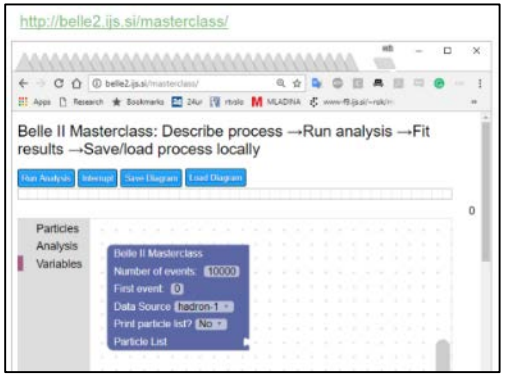
- Long Night of Science, Open Days, Highlights der Physik usw.
- Mobile exhibition module NEW
- Virtual Reality Systems NEW



→ High school students

- Data analysis and detectors (Masterclasses, CERN programs, research projects)
- Nuclear and hadron physics NEW





→ Students/Fellows

- Internships, SHK, hospitances, regulars´ tables, Fellow meeting
- Fellow School NEW

KONTAKT Work Packages 4 - 6

→ Scientists

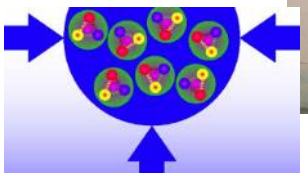
- Training in science communication (Workshop z. Vermittlung von HEP)
- Portraits „Teilchenjäger“
- Media training NEW

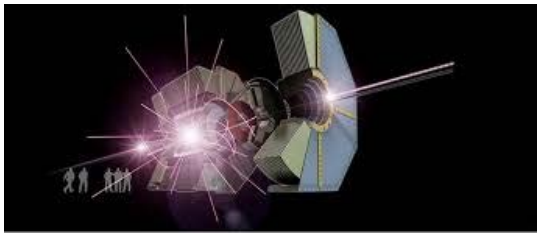
→ Journalists

- Support for press offices of the institutes
- Expanding media work
- Journalist trip to CERN NEW

→ Project team and institutes

- Wiki, data base, materials
- Internal and external communication
- Integration of new groups / sites





Thank you for your interest!

mail@teilchenwelt.de

www.instagram.com/netzwerk_teilchenwelt/

www.facebook.com/teilchenwelt/

PROJEKTLEITUNG

TECHNISCHE UNIVERSITÄT DRESDEN

PARTNER

CERN

DESY.

SCHIRMHERRSCHAFT

DPG

FÖRDERER

GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung

Dr. Hans Riegel-Stiftung

NETZWERK TEILCHENWELT