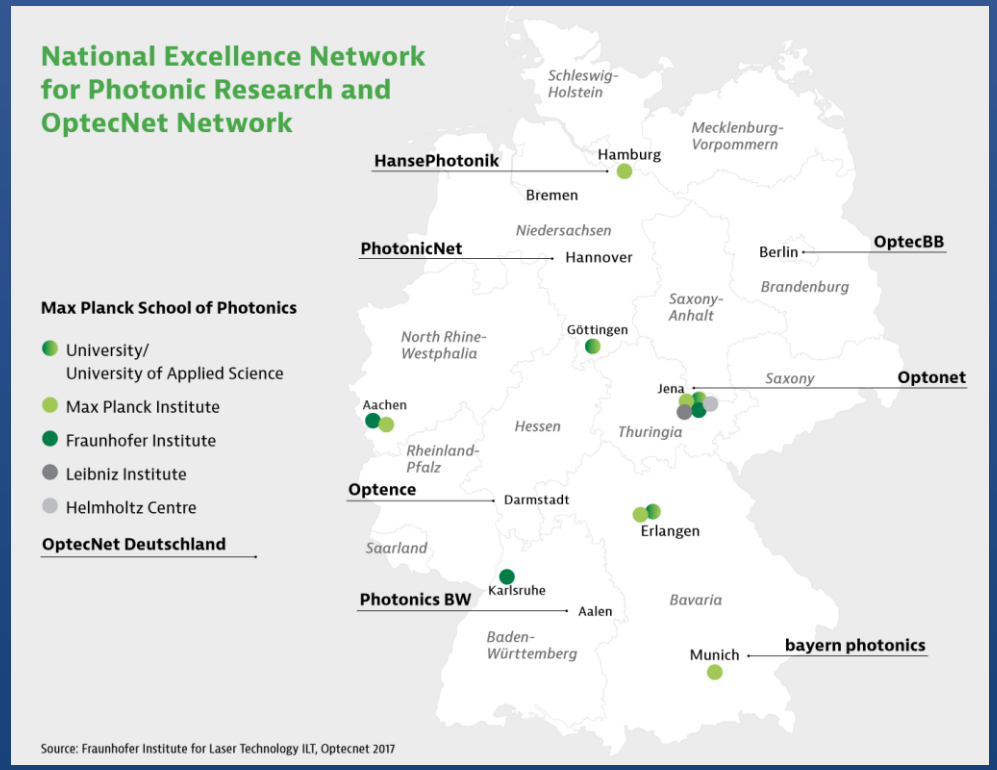
Technician Education in Germany

A Visit to Laser/Photonics Manufacturers and Technician Organizations - October 2019



HI-TEC CONFERENCE – JULY 2020

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OUTLINE

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Purpose of Trip

To learn about the world-renowned system of technical education that enabled the economy of Germany to grow from the ruins of Second World War to the global industrial power that it is today.

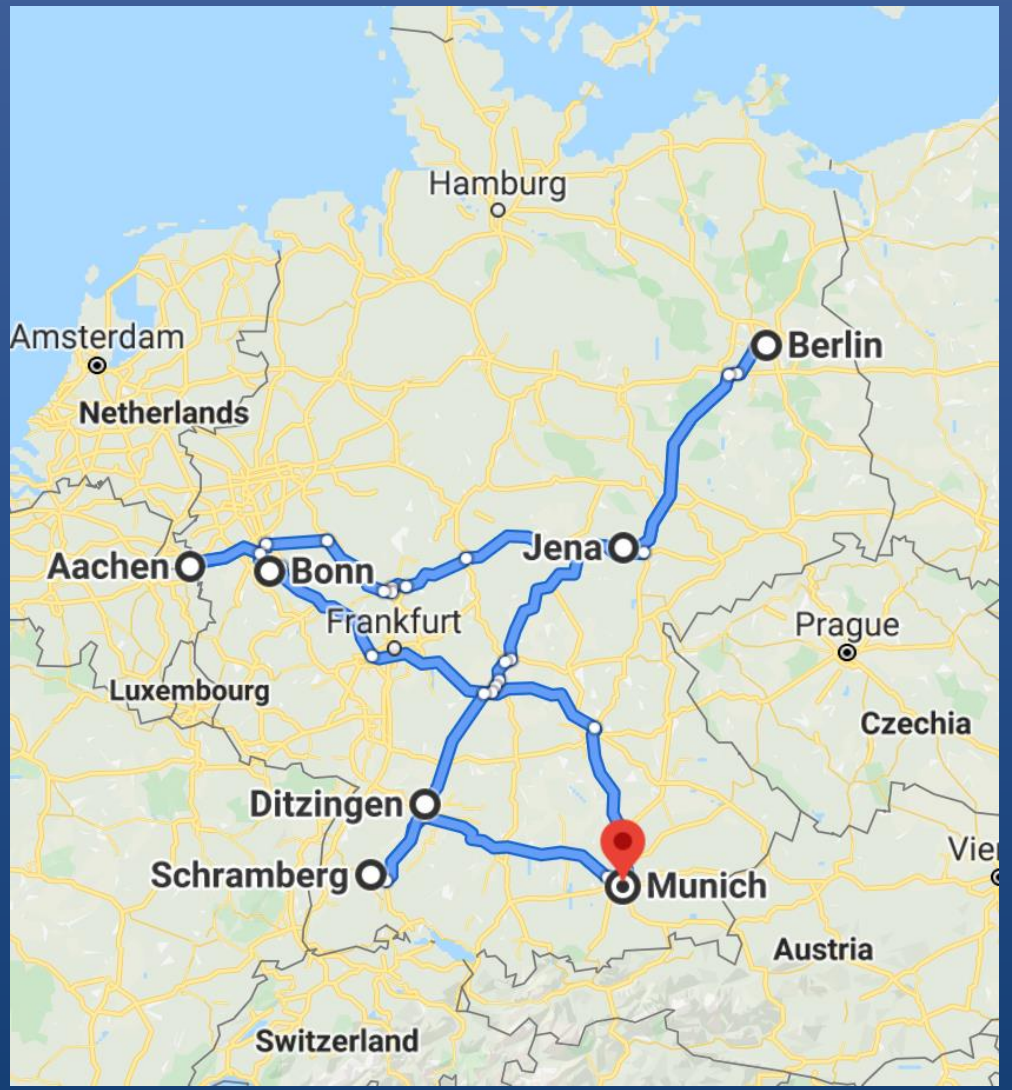
The trip focused on the industries of optics, lasers, photonics.

The German Economic Miracle

- After the 2nd WW, in 1948 the industrial output was 20% of that of 1936
- In 1958, the industrial output was four times that of 1948
- In 1989, East and West Germany were reunited
- A country of 83 million, about the size of California is forth in manufacturing output at 687 billion USD, following US, China, and Japan in 2019

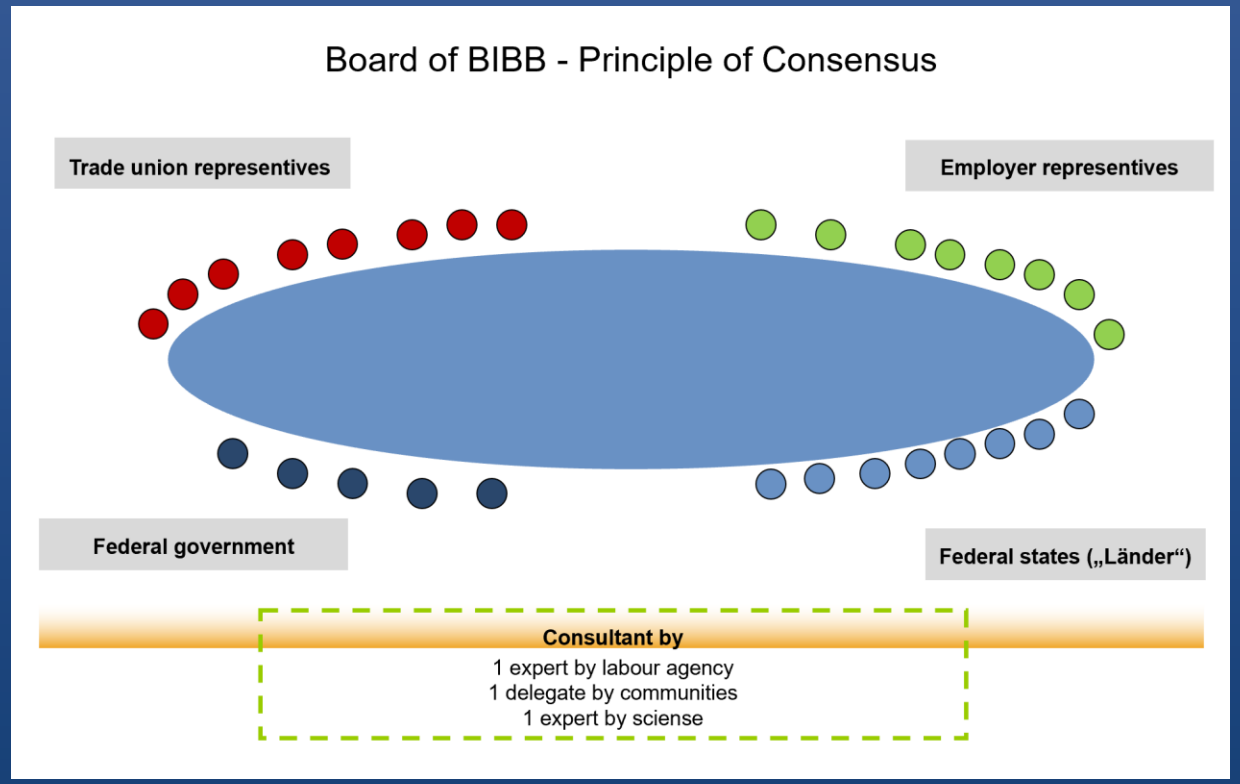
Locations Visited

LOCATION	DESCRIPTION
Munich	Airport of Arrival
Bonn	Federal Department of Education - VET Office
Aachen	Fraunhofer Laser Institute
Jena	Optonet – Photonics Cluster of Jena
Berlin	Spectaris – Photonics Cluster of Berlin
Jena	Jenoptik – Optics/Photonics Manufacturer
Jena	JENAER BILDUNGSZENTRUM – Dual System School
Ditzigen	Trumpf Laser Headquarters – Laser manufacturer
Schramberg	Trumpf Disk Laser R&D Facility
Munich	Airport of Departure

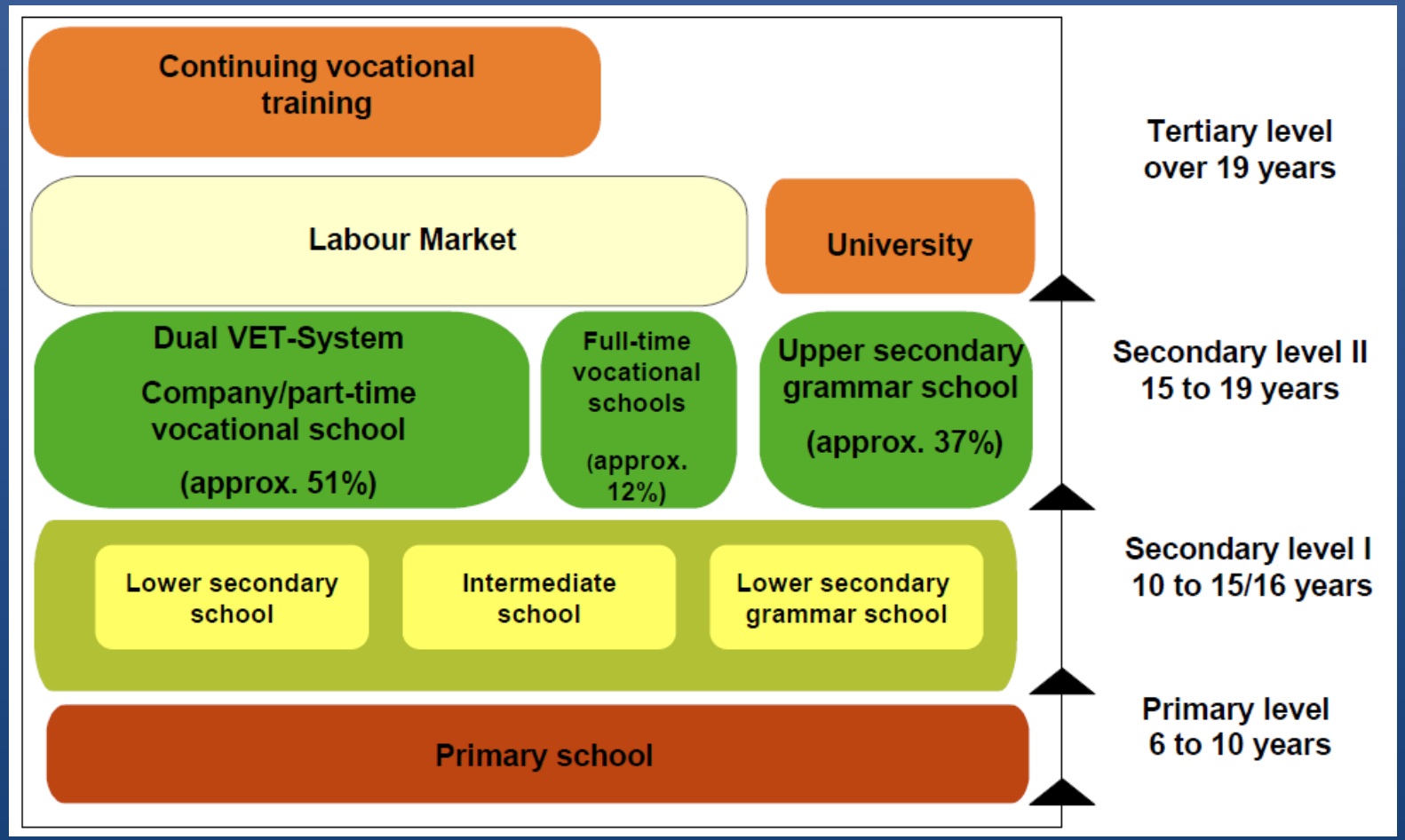


Federal Department of Education (BIBB)
Office of Dual Vocational and Technical Education

- Dual Program started in 1919 with apprenticeships through craft worker unions
- It has changed and evolved over time
- Today the programs are jointly created by consensus and administered by the government, industry, and workers unions.
- Currently it offers 326 professional trades that include diamond cutters, aircraft mechanics, photonics technicians and even chimney sweepers.



German Educational System



The Dual VET-System starts after “middle school” (ages 15-19)

The Dual System

- At 9th grade, students have a choice to go into the dual program of apprenticeship or continue to high school that will prepare them for university studies.
- The dual program lasts 2 to 3.5 years depending on the occupation.
- After a year of career exploration, the student decides at the 9th grade what occupation to study.
- Student interviews with sponsoring companies and signs a contract with company that will provide the training.
- Student goes to school 2 days of the week to learn the general knowledge content of education.
- Student goes to work the remainder of the week where an approved training program is followed by the company.
- Student gets paid and receives company benefits such as holidays as agreed on the original contract.
- The dual program ends at grade 12 with a standardized national exam, and a certification in the field if successful.
- The student is free to find employment in the job market, but the majority of completers are hired by the company that offered the training program.

Dual System Video

Fraunhofer Institute of Laser Technology (ILT)

- ILT is a worldwide development and contract research institute
- Develops new laser beam sources and components, precise laser-based metrology, testing technology and industrial laser processes. This includes laser cutting, caving, drilling, welding and soldering as well as surface treatment, micro processing and additive manufacturing
- Fraunhofer ILT is engaged in laser plant technology, process control, modelling and simulation as well as in the entire system technology
- Offers feasibility studies, process qualification and laser integration in customer specific manufacturing lines

Optonet

- It is the photonics cluster of 180 companies in the Thuringian region.
- Promotes its members in international trade shows
- Collaborates with VET schools and universities to ensure continuous supply of technical talent
- Works with local and federal government to promote optics and photonics interests

optonet
Photoniknetzwerk Thüringen

Jenoptik

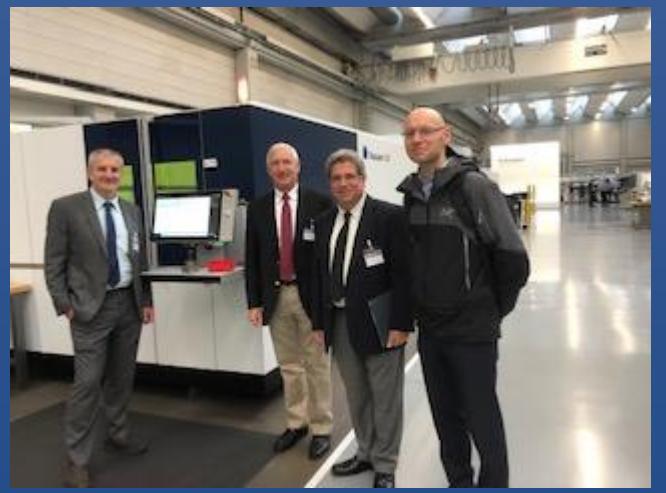
- JENOPTIK is a global technology group with a presence in over 80 countries.
- Offer products and services for the following photonics markets:
  - Optics & Mechanics
  - Lighting
  - Technology Measurement Technology & Sensor Technology
  - Micro & Fiber Optics
  - Optoelectronics
  - Lasers & Beam Sources

JENAER BILDUNGSZENTRUM GmbH
Jena Dual VET School

- Created and funded jointly by the federal government and the photonics companies: SCHOTT, CARL ZEISS, and JENOPTIK
- Its mission is to supply the photonics technicians needed by the three companies

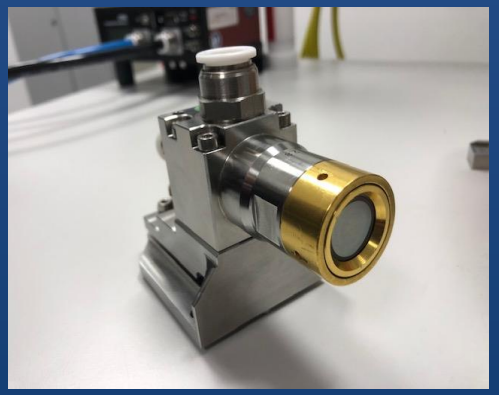
Trumpf - Ditzigen

- World Headquarters of Trumpf Corporation
- Founded in 1923, has 14,490 employees world-wide and 3.8 Billion Euros in sales in 2019
- Invented the disk laser and is using it for metal cutting and processing
- It has plants in Connecticut and Michigan
- Member of LASER-TEC advisory board
- Hires graduates form OPCN colleges



Trumpf - Shramberg

- Trumpf's research center for Disk Lasers
- International technical training center
- High entrepreneurial spirit
- Company evolved from a clock manufacturing business when mechanical clocks were replaced with electronic ones in the 1970's



Feedback from our German Hosts
Present Challenges

Demographic:
Shortage of skilled workers
Companies have difficulty in filling training positions
Vocational schools have difficulty in filling their classes for several occupations
Difficulties for companies in integrating disadvantaged young people (especially immigrants)

Speed of Technology Change:
Rapid change and rise in technical requirements in the workplace
Continuing internationalization of business

Internationalization of education and training:
Adapting to the new European Education Area program
Introduction of new process and competence-oriented VET concepts

Lessons Learned

Dual Vocational Education System:

- The organized dual vocational training program has a 100-year history in Germany
- It has become part of life and well accepted by industry, unions, schools and the public
- It provides a uniform high-quality education and training throughout Germany
- Because of its structure is very slow to move and keep up with fast changing technologies

Generation Z issues:

- Youth is not interested in technical/vocational jobs
- Shortage of technicians
- Economic immigrants are the new source of technicians, but there are issues with gaps in education and language

Summary

- The Dual Vocational Education Program has a 100-year old successful history
- It requires collaboration and consensus from industry, craft workers unions, schools, public
- Because of its structure is slow to make changes or add new programs
- Companies are creating their own training schools outside the Dual system to enable them to provide fast specialized training (Trumpf)
- Germany faces the same issues as the US with generation Z who is not interested in vocational and technical education as earlier generations
- Germany looks to economic immigrants to fill the empty technician jobs

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