D-2: Science in Space

25 Year Aniversary D-2 Mission

DLR Oberpfaffenhofen

4. May 2018

eine sehr persönliche Sicht

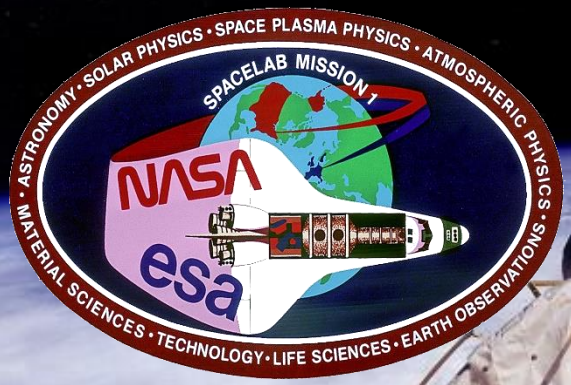
Berndt Feuerbacher

Editor & Translation: Joachim J. Kehr
Journal of SpaceOperations &
Communicator

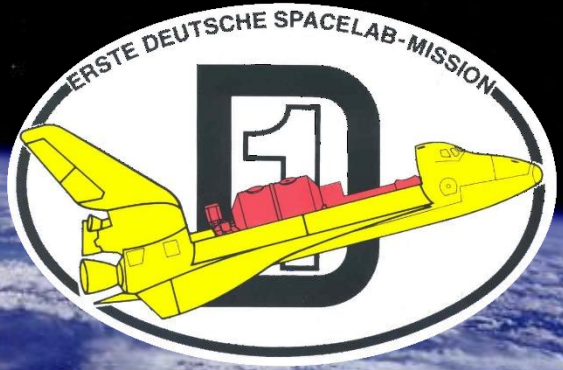
D-2: A Success Story

Successful Precursor- Missions:

SL-1 (1983)



D1 (1985)



D-2: A Success Story

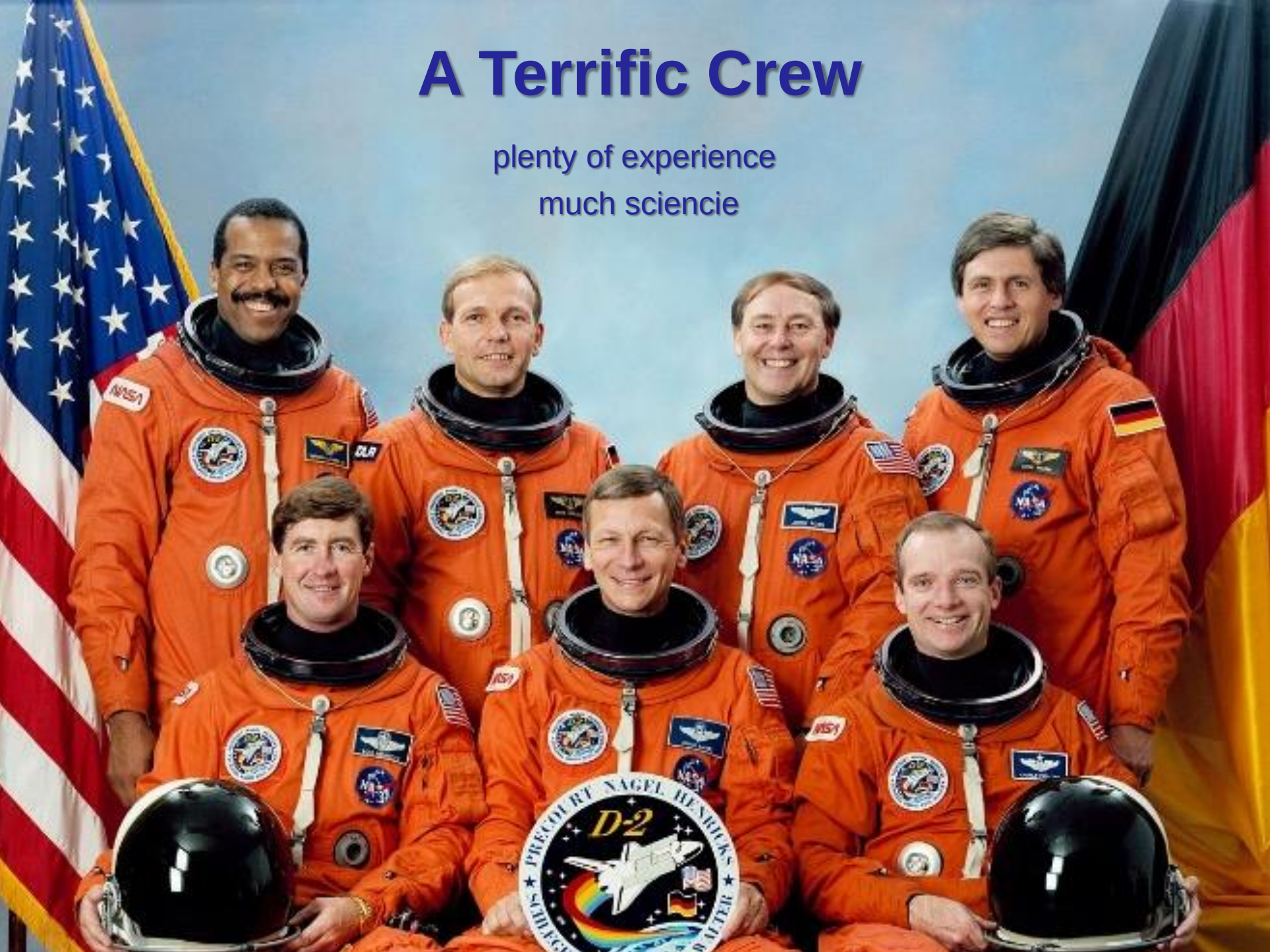
Successful Follow-up Missions

EURECA, MSL, MIR, TEXUS… and ISS

A Terrific Crew

plenty of experience

much sciencie



A Terrific Team

… with a strong Back-up Crew

Many have contributed

The Pioneers:

- Gottfried Greger
- Peter Sahm
- Hauke Dodeck

6. Mai 2003

The launch was adventurous

>Originally planned for 1988

>Shifted to February 1993 due to Challenger accident

>Followed by more delays

>22. März 1993: Shut down @ T-3

Columbia lift-off on 26. April 1993

88 Experiments carried out

International participation (11 Countries):

- ESA, USA, Japan

Multidisciplinary:

- Life & Physical Sciences, Technology, Astronomy, Earth Observation

Second Generation: World-class science

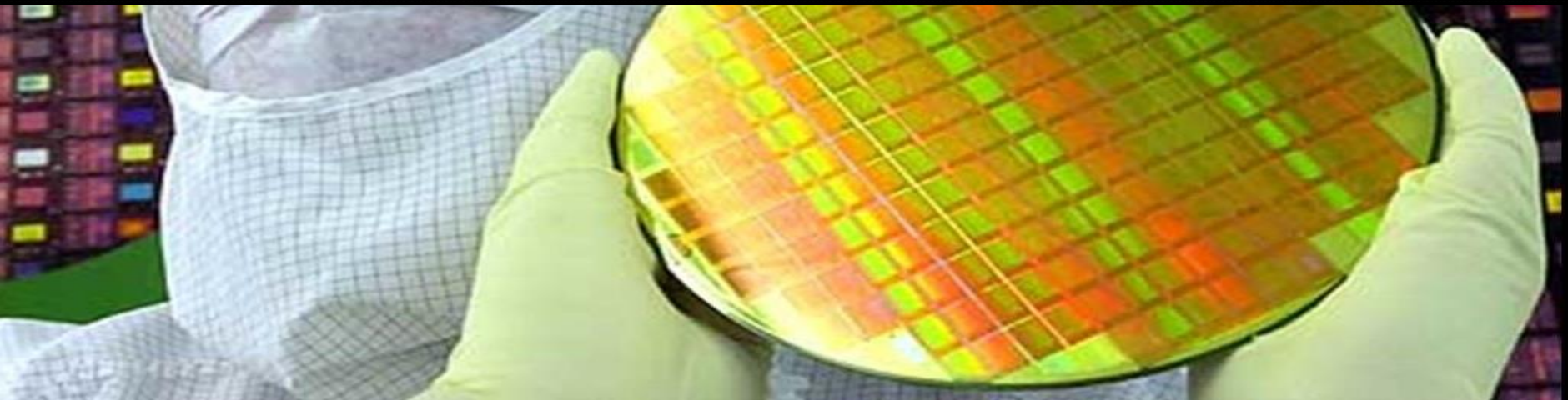
Scientific Highlights

Crystal growing:

- Formerly more a matter of alchemy
- D-2: from Empirical to Systematic approach

Now: industrial standard

Example: Industrial Waver Production



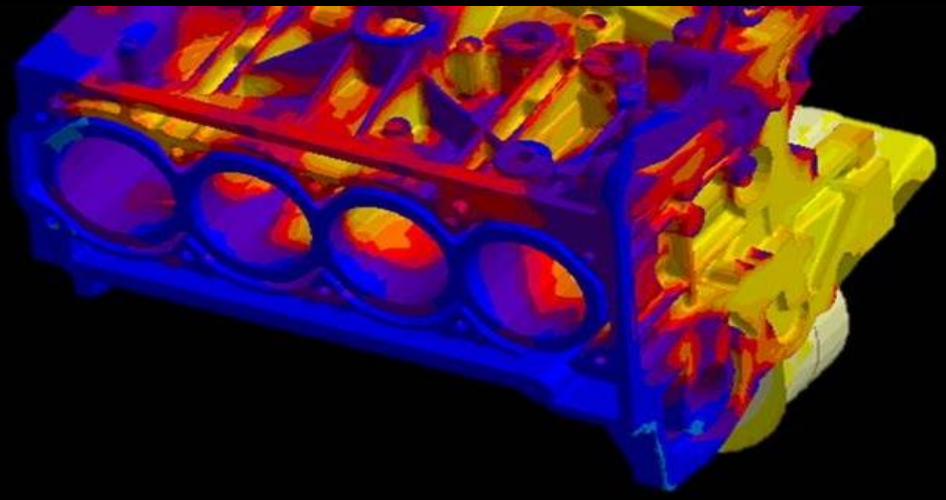
Scientific Highlights

Casting process:

- New understanding of solidification
- Temperature and concentration distribution
- Material parameters understanding

Now: Modelling of complex components

Example: Automobile Industry, Durable Engine Blocks



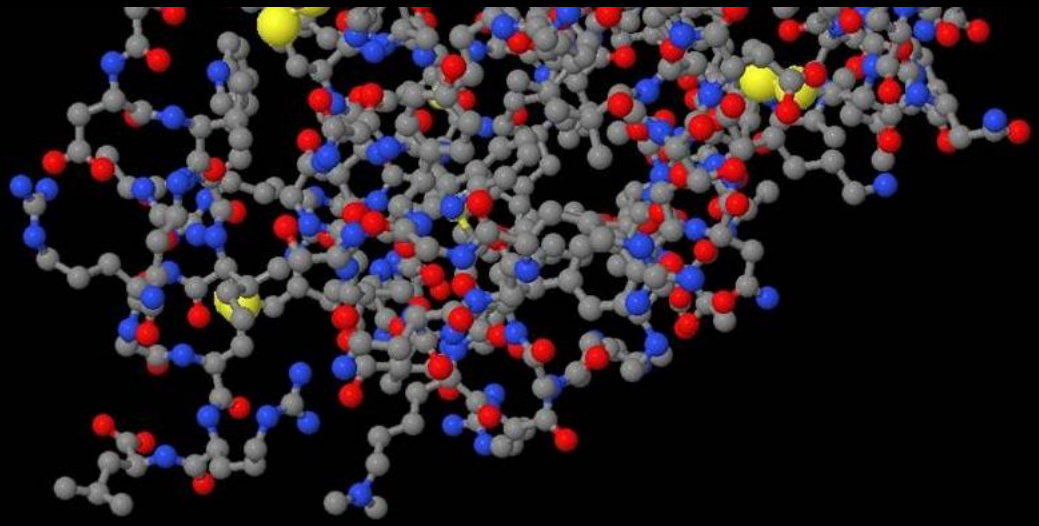
Scientific Highlights

Protein crystallization (for structural analysis)

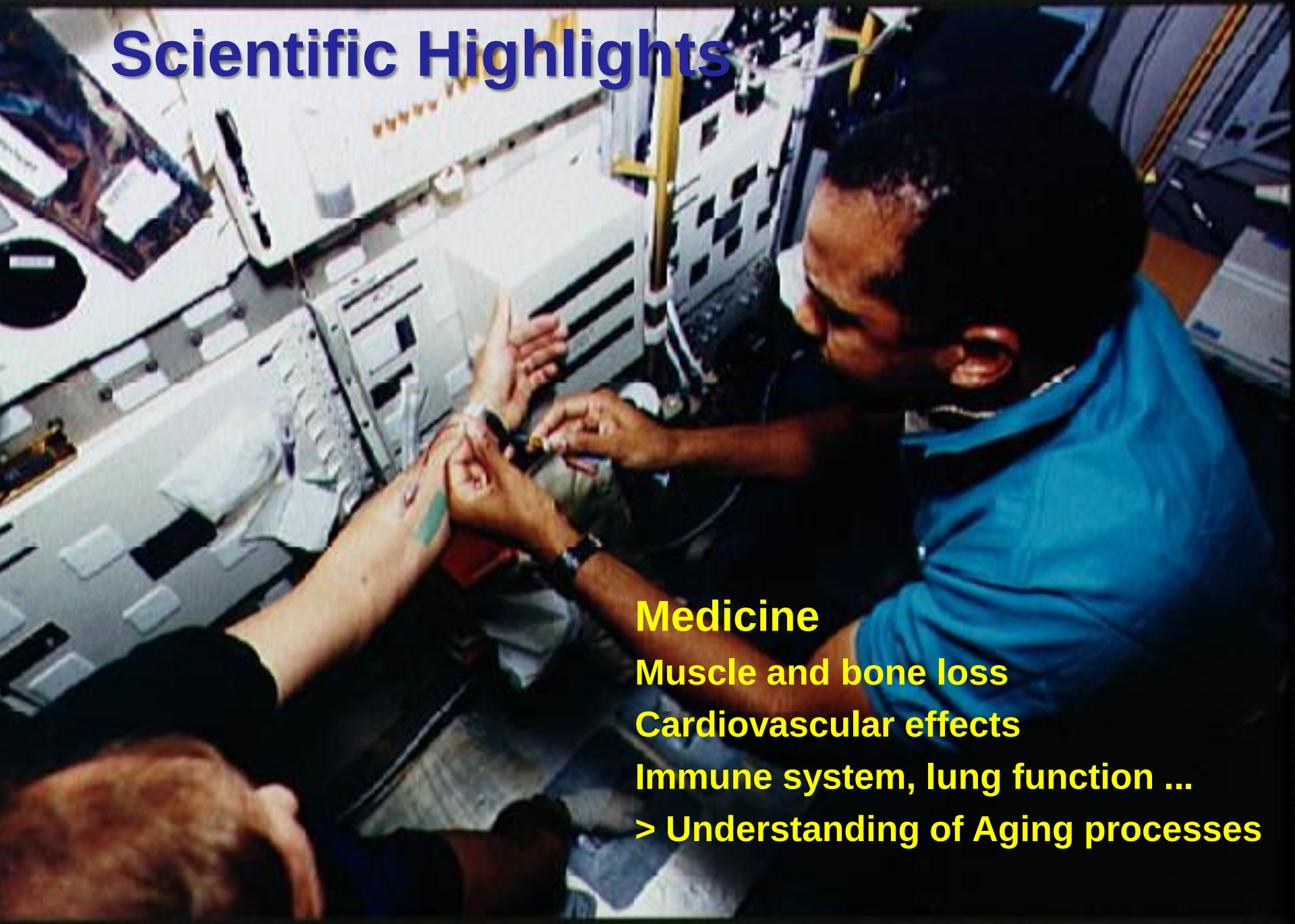
- Large, perfect crystals
- New techniques
- Many structures identified

New drugs

Example: Identification of Complex Protein Structures



Scientific Highlights



Medicine

Muscle and bone loss

Cardiovascular effects

Immune system, lung function ...

> Understanding of Aging processes

Scientific Highlights

Rotex

Kristallzucht

Robotics technology at its finest

>Forerunner for many new developments

>CIMON*) (first intelligent Assistant-Robot) accompanies A. Gerst on ISS in 2018 during the HORIZON mission

- **Technology used in industry and startups**

*) CIMON = Crew Interactive Mobile Companion

GSOC was responsible for Payload Operations

>For the first time payload operations outside USA
>First mission in the new GSOC/MSCC*) control room!

*)MSCC= Manned Spaclabs Control Center earmarked for Columbus operations,
it finally became the Col-CC, Oberpfaffenhofen

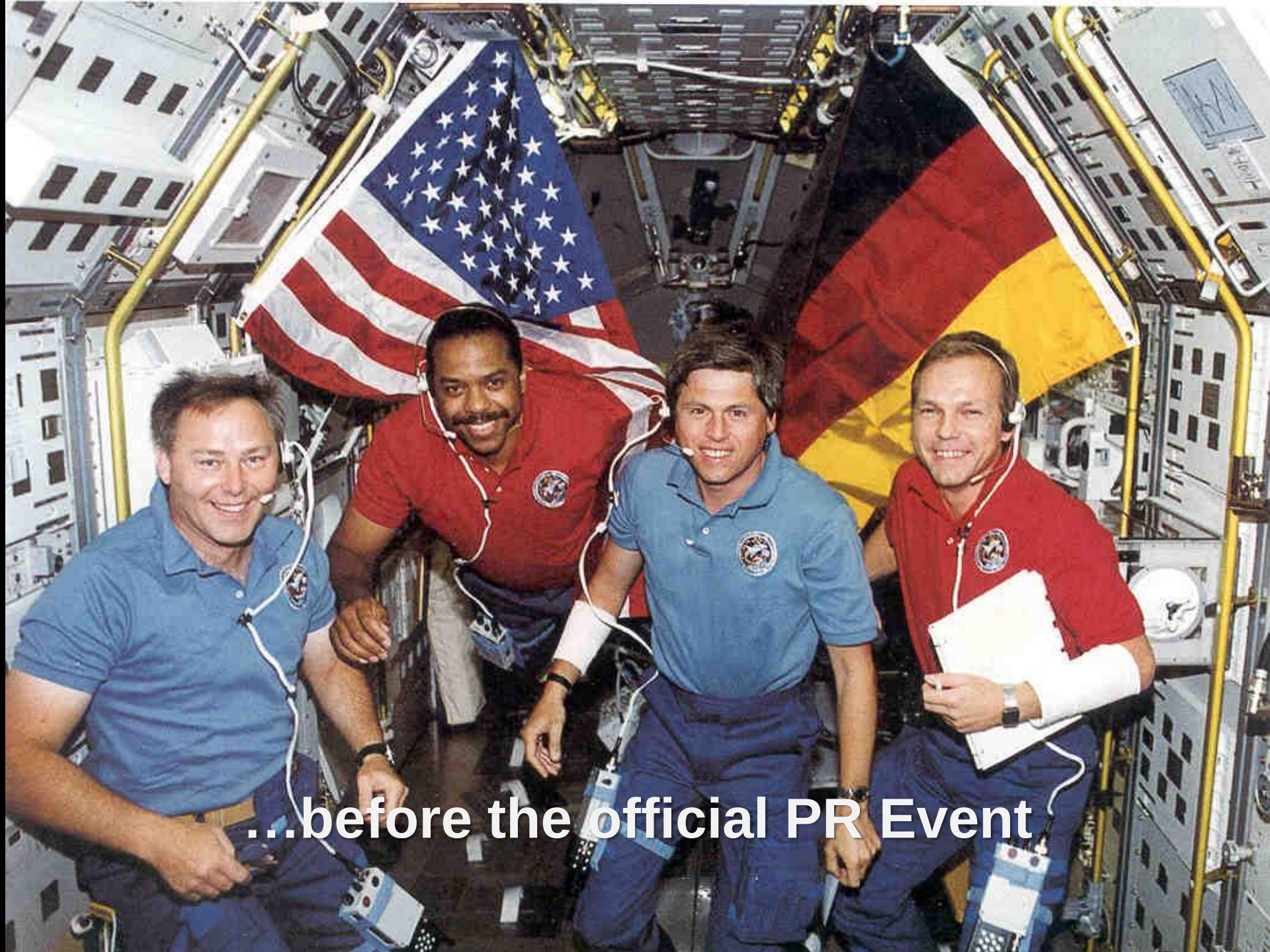
…while the crew enjoyed themselves

Floating completely weightless

Sometimes things go haywire

A good procedure can make your day

Getting dressed behind the curtains…


…before the official PR Event

More coffee anyone?

Hans at the ham-radio

Ulrich is demonstrating a perfect touchdown

Perfect Landing on 6. Mai 1993

After a mission extension by 1 day and 160 earth orbits
Columbia touched down at Edwards Airforce Base, CA

D-2: A Success Story

- D-2 was an important milestone for research under weightlessness
- Basic pioneering work was achieved

- The Results
  - …have found their way into the textbooks
  - …laid the foundation for later research work
  - …are applied by industry
  - …enabled developments such as COLUMBUS
  - …and led to lasting progress !

Congratulations to the Crew and all Parties involved!