

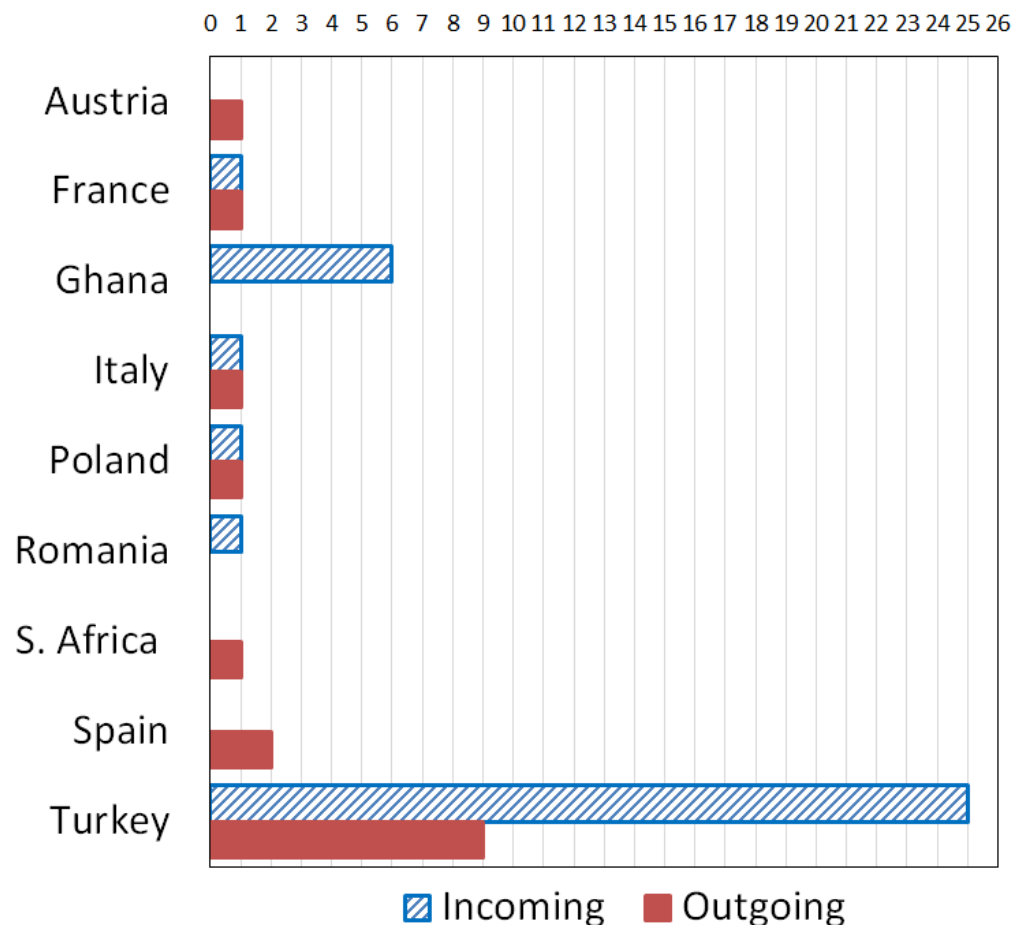
Overview of the International Activities in 2021

Student Mobility

Despite the continuing Covid-19 pandemic, a certain student mobility could be maintained also in this year, with the competent support of the **International Office (Dr. Katz)** in all respects.

We had **Incomings** from **France, Ghana, Italy, Poland, Romania** and **Turkey** and **Outgoings** to **Austria, France, Italy, Poland, South Africa** and **Turkey**.

A graphical overview of the Incoming and Outgoing mobility data is provided in the diagram below (please note that uncertainties in the numbers are possible).



Compared to last year (Newsletter International MV, Nr. 11, 2021), the following trends can be observed: The total mobility volume (Incomings+Outgoings) is increased about 15%. This happened, however, in favour of Incomings (increase about 40%) but in detriment of Outgoings (decrease about 20%) resulting in a less even Incoming-Outgoing balance. Furthermore a smaller spectrum of exchange countries can be identified in the present year. There are 9 countries with student exchange in the this year, whereas this number was 13 in last year. Summarizin, an increase in the number of Incomings and a decrease in the number of Outgoings are observed in this year, accompanied by a decrease in the number of exchange countries. Similar to last year, the highest activity is observed for **Ghana** and **Turkey**.

International Education Projects of ZIES

The Institute **ZIES** (Zentrum für Innovative Energiesysteme) under the Leadership of **Prof. Adam** has been active in an **Erasmus+ Project** with **Ghana**, where ZIES (Prof. Adam, Riegebauer, Wohlfahrtstätter) is cooperating with three universities from Ghana (*Cape Coast Technical Univ., Koforidua Technical Univ., Takoradi Technical Univ.*). In this year, again, 6 students from Ghana were hosted by ZIES, who attended various courses and enjoyed a supporting program.



The photo above shows the incoming students from Ghana in cable railway during an excursion to Wuppertal.



In the project **Renewable Energy Education Framework (REEF) Ghana**, in addition to the above-mentioned Ghanaian universities, the *Univ. Cape Coast* and the *Renewable Energy Association of Ghana* are also involved. In this project, **ZIES (Prof. Adam, Riegebauer, F. Ille, Wohlfahrtstätter)** collaborates with partners to increase synergy effects in academic education and unify curriculum modules with high practical relevance. In 2021, a ZIES team visited the partners in Ghana, within the framework of this program. The photo left is taken during a training of the professors of the Koforidua Technical Uni. by the ZIES team on an experimental kit for practice oriented teaching.

Within the framework of the **CE3 (Cross boarder Entrepreneurial Energy Education) Project** coordinated by **ZIES (Prof. Adam, Kretschmar, Riegebauer, Wohlfahrtstätter)** and **FLIX (Prof. Niemann, Fussenecker, Schlösser)** activity, 4 *Ghanaian* students attended the start-up challenge of German-Dutch bootcamp in Düsseldorf (photo right).



International Research & PhD



Ms. Ajmi from **Tunisia** (photo left), who was visiting **CFS (Prof. Benim)** in last year completed her **Ph.D. thesis** on „Hydrodynamic and turbulent characteristics of an offset jet flow“ in 2021 and received her Ph.D. degree from the *University of Monastir*. Prof. Benim was co-supervisor of the thesis.

Prof. Benim also acted as **Examiner** for **4 Ph.D. Thesis** from **India**, from the universities: *Anna University (2x) Chennai, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai; National Institute of Technology Duragpur.*

International Conferences

Because of the pandemic, conferences were normally being held online, or in hybrid form. Thus, the given country names below, do not necessarily indicate the place of personal meeting, but rather the location of the organizing institution.

Prof. Benim contributed to the organization of a number of international conferences as **Member** of the **Scientific Committee**. These were three conferences in **India** (*3rd International Conference on Advances in Mechanical Engineering and its Interdisciplinary Areas (ICAMEI-2021) 05-07 January 2021, Kolaghat; 48th National Conference on Fluid Mechanics and Fluid Power, 27-29 December 2021, Pilani; The 4th International Conference on Frontiers in Industrial and Applied Mathematics (FIAM-2021), December 21-22, 2021, SLIET, Longowal*) one in **France** (*International Conference on Materials and Energy (ICOME 2021), 09-11 June 2021, Paris*) one in **Spain** (*International Meet & Expo on Biomedical Engineering and Systems (BIOMEDMEET2021) 14-16 October 2021, Valencia*) and one in **Turkey** (*23rd Congress on Thermal Science and Technology (CTST2021), 08-10 September 2021, Gaziantep*). Furthermore **Prof. Benim** was **Co-Organizer** and **Co-Chair** of the conference „13th International Conference on Computational Heat, Mass and Momentum Transfer“, May 18-21, 2021, Paris, **France** .

Prof. Kameier and his team were contributing to *ASME Turbo Expo, June 7-11, 2021*. **Prof. Deckert** contributed to the *49th SEFI Annual Conference "Blended Learning in Engineering Education: challenging, enlightening – and lasting?", Berlin, December 2021*. **Prof. Zielke** and colleagues were contributing to the *25th International Conference on Pattern Recognition, Milano, Italy (2021)* and *3rd European Conference on Connected and Automated Driving, EUCAD 2021, Belgium*. **Prof. Weber** gave a talk at the international meeting of the *European Geosciences Union, EGU21, 19-30 April, 2021*.

Publications in International Conferences and Journals

- L. Frank, M. Rödder, **M. Neef**, **M. Adam**: Heating, ventilation, domestic appliances – an energy integrated system concept for household of the Future, *Energy* 234 (2021) 121303.
- C. Deniz Canal, Y. E. Boke, O. Aydin, **A. C. Benim**: Computational analysis of pulverized coal co-firing with biomass in 150 WMe unit of Tuncbilek thermal power plant, *Journal of Thermal Science and Technology* 41 (1) (2021) 37-50.
- A. C. Benim**, M. S. Bhagavan: Numerical investigation of friction laws for undulated channel, *International Journal of Numerical Methods in Heat and Fluid Flow* 31 (6) (2021) 1837-1856.
- A. C. Benim**: Numerical calculation of sink velocities for helminth eggs in water, *Computation* 9 (12) (2021) 136.
- A. C. Benim**, C. Deniz Canal, Y. E. Boke: A validation study for RANS based modelling of swirling pulverized fuel flames, *Energies* 14 (2021) 7323.
- B. Pfeiffelmann, **A. C. Benim**, F. Joos: Water-cooled thermoelectric generators for improved net output power: a review, *Energies* 14(35) (2021) 8329D.
- K. Mandal, **A. C. Benim** (Eds.): Proceedings of the 3rd International Conference on Advances in Mechanical Engineering and its Interdisciplinary Areas (ICAMEI 2021) 5th -7th January 2021, Kolaghat, India, *IOP Conference Series: Material Science and Engineering* 1080 011001 (2021).
- R. Bennacer, F. Bakir, S. Koudri, S. H. Suh, **A. C. Benim** (Eds.): Special Issue "Computational Heat, Mass and Momentum Transfer - III", *Computation* (2021).

- A. C. Benim:** Challenges in modelling turbulent combustion, *Keynote Lecture*, Proc.48th National Conference on Fluid Mechanics and Fluid Power, 27-29 December 2021, Pilani, India.
- S. Bhattacharyya, D. K. Vishwakarma, S. Roy, K. Dey, **A. C. Benim**, R. Bennacer: Computational investigation on heat transfer augmentation of a circular tube with novel hybrid ribs, *E3S Web of Conferences* 321 (2021) 04012.
- A. Kumar, K. Dey, S. Bhattacharyya, A. R. Paul, **A. C. Benim**, D. K Vishwakarma, Z. Huan: Augmented thermal performance in a non-uniform heat flux circular tube with twisted tape insert using hybrid nanofluid, *E3S Web of Conferences* 321 (2021) 04009.
- C. Deniz Canal, E. Boke, **A. C. Benim:** Numerical analysis of pulverized biomass combustion, *E3S Web of Conferences* 321 (2021) 01001.
- B. Pfeiffelmann, M. Diederich, M. Heese, A. Hamberger, **A. C. Benim:** Development of a heat exchanger for cogeneration via TEG, *E3S Web of Conferences* 321 (2021) 02002.
- A. C. Benim**, B. Pfeiffelmann: Computational analysis of lifted hydrogen flame, in: M. Portarapillo and A. Karname (Eds.) *Advances in Energy Research*, 3rd ed. Vide Leaf (2021).
- S. Bhattacharyya, K. Dey, D. K. Vishwakarma, **A. C. Benim:** Numerical analysis of heat transfer and pressure drop in square channel with novel centre hole inclined ribs, Proc. 48th National Conference in Fluid Mechanics and Fluid Power (FMFP), BITS Pilani, Pilani Campus, RJ, India, December 27-29, 2021.
- M. Diederich, L. Di Bartolo, **A. C. Benim:** Comparison of prediction accuracy between interpolation and artificial intelligence application of CFD data for 3D cavity flow, Proc. 4th International Conference on Frontiers in Industrial and Applied Mathematics, Longowal, Punjab, India, December 21-22, 2021.
- M. Diederich, F. Gül, C. Özman, **A. C. Benim**, L. Ihringer, D. Möller: Numerical modelling and experimental validation of mechanical separation of helminth eggs for wastewater purification, Proc. 4th International Conference on Frontiers in Industrial and Applied Mathematics, Longowal, Punjab, India, December 21-22, 2021.
- C. Özman, T. Saner, F. Gül, M. Diederich, **A. C. Benim**, U. Janoske: Computational and experimental investigation of flow and convective heat transfer along rough surfaces, Proc. 4th International Conference on Frontiers in Industrial and Applied Mathematics, Longowal, Punjab, India, December 21-22, 2021.
- C. Deckert**, A. Mohya, S. Suntharalingam: Virtual whiteboards & digital post-its - incorporating internet-based tools for ideation into engineering courses, Proc. 49th SEFI Annual Conference "Blended Learning in Engineering Education: challenging, enlightening – and lasting?", Berlin, December 2021.
- V. I. N. Guillen, **C. Deckert:** Cultural influence on innovativeness - links between "The Culture Map" and the "Global Innovation Index", *International Journal of Corporate Social Responsibility* 6(1) (2021). (2021) 6:7
- P. Strucks, L. Failing, **S. Kaluza:** A short review on Ni-catalyzed methanation of CO₂: reaction mechanism, catalyst deactivation, dynamic operation, *Chem. Ing. Tech.* 93 (2021) 1526-1536.
- P. Strucks, C. Watermann, **K. Weber, S. Kaluza:** Systematic investigations of vibrational and fluid-mechanical stability of coated monolithic catalysts, *Chem. Ing. Tech.* 93 (2021) 809-813.
- K. Girod, H. Lohmann, **S. Kaluza:** Methanol synthesis with steel mill gases: performance investigations in an on-site technical center, *Chem. Ing. Tech.* 93 (2021) 850-855.
- T. Biedermann, Y. Moutamassik, **F. Kameier:** Feasibility study on the effect of blade inclination for heavy duty centrifugal fans – aerodynamic aspects, Proc. ASME Turbo Expo 2021, GT2021-58505.
- M. Elhaddad, A. Valentinitich, P. Föhr, K. Achterhold, F. Pfeiffer, S. Kollmannsberger, J.S. Kirschke, **M. Ruess**, E. Rank: Micro-CT-based finite cell analysis of vertebral bodies: a validation study, *International Journal for Numerical Methods in Biomedical Engineering* (2021)
- Y. Guo, Z. Zou, **M. Ruess:** An isogeometric mixed thin-shell formulation for multi-patch analyses in the framework of non-linear elasticity, *Computer Methods in Applied Mechanics and Engineering*, 380 (2021) 113771.
- M. Becker, J. Lippel, **Th. Zielke:** Dimensionality reduction for data visualization and linear classification - robustness vs. Accuracy, Proc. 25th International Conference on Pattern Recognition, Milano, Italy (2021).
- M. Becker, J. Lippel, **Th. Zielke:** Dimensionality Reduction for Data Visualization and Linear Classification, and the Trade-off between Robustness and Classification Accuracy, Proc. 25th International Conference on Pattern Recognition, Milano Italy (2021).
- Th. Zielke:** Artificial Intelligence Standardization, Proc. 3rd European Conference on Connected and Automated Driving, EUCAD 2021, Belgium (2021).

EDITORIAL STAFF



Prof. Dr. A. C. Benim
(alicemal.benim@hs-duesseldorf.de)

This is an overview, which is not claimed to be exhaustive. Some activities have been omitted due to space limitations. We apologize, in advance, for any activity that might have unintentionally be omitted due to an oversight.



T. Atalay
(tuba.atalay@hs-duesseldorf.de)