Regina Rüffler studied chemistry at the Saarland University, where she received in 1981 her PhD degree supervised by Prof. U. Gonser. She was a lecturer at the Institute of Physical Chemistry of the University of Hamburg from 1989 to 2002, interrupted by a two-year stay as a guest researcher at the Saarland University. During her lectureship she gave numerous lectures and supervised practical courses and numerical exercises at the bachelor´s as well as the master´s level.

Her passion for teaching led her to join the Eduard-Job-Foundation in 2002. In collaboration with G. Job the textbook "Physical Chemistry–An Introduction with New Concept and Numerous Experiments" was published. Meanwhile, it has also been published in English and parts of it have been translated into Spanish and Chinese.

In further sub-projects, Regina Rüffler revises the descriptions of the more than one hundred experiments integrated into the textbook, complements them with carefully designed and recorded videos and writes a students´ manual with numerical exercises and corresponding detailed solutions, which fit the newly structured teaching material.

In addition, she presented the new concept in all its facets in experimental lectures and posters at many national and international conferences. She has also won several awards for her educational videos. At the University of Hamburg, the new concept has been implemented in the experimental lecture “Thermodynamics” for students of wood science given since 2012. This lecture always obtained very positive results from evaluation.

■ **Articles** (selection)

G. Job: "Zur Vereinfachung thermodynamischer Rechnungen (Simplifying Thermodynamical Calculations)“, Z. Naturforsch. **1970**, *25a*, 1502

G. Job, T. Lankau: "How Hamful is the First Law?“, Ann. N.Y. Acad. Sci. **2003**, *988*, 171-181

G. Job: "Antrieb chemischer Reaktionen – Messung, Berechnung, Anwendung (Chemical Drive of Reactions–Measurement, Calculation and Application)“, MNU **2004**, *57*, 223-230

G. Job, F. Herrmann: "The chemical potential–a quantity in search of recognition”, Eur. J. Phys. **2006**, *27*, 353-371

R. Rüffler, G. Job: “Phänomene der Kinetik – mit dem chemischen Potenzial betrachtet (Phenomena of Kinetics–Approached by the Chemical Potential)“, Beiträge zur MNU-Tagung, Regensburg **2009**, Lehmanns Media, Berlin

Board of Directors and Council

Dipl.-Ing. **Eduard. J. Job** was the founder of the Eduard Job Foundation for Thermo- and Matterdynamics in Hamburg, Germany. As a globally active entrepreneur, he built his company’s success upon the application of thermodynamics. His professional career highlights his special interest in this field. After studying in Hamburg and the United States, he started in engineering design, created new products and received numerous patents. After successfully leading SFH-ROM and heading Minimax AG, he founded his own company in 1971, Job GmbH in Ahrensburg near Hamburg. Today, Job GmbH leads the global market in thermally activated thermo-bulbs for automatic sprinkler systems.

Eduard Job passed away in February 2009, however, the activities and targets of the JOB-group as well as of the Eduard-Job-Foundation were continued by the employees and heirs till the end of 2017.

In January 2018, Dipl.-Ing. **Norbert Job** - a brother of the founder - took over the complete financial sponsoring of the foundation thus securing the continuation of its work.

Executive Committee Members

(September 2018)

Prof. Dr. **Friedrich Herrmann** (Chairman) started his academic career at the Institute National des Sciences Appliquées in Lyon. 1975 he became professor at the Department of Didactics of Physics at the University of Karlsruhe. Also in his retirement he abides by this assignment since 2005.

StD. Dr. **Heiner Schwarze** (Deputy Chairman) has been head for secondary schools at the IQSH in Neumünster. From 2006 until 2014 he worked at the institute for quality development at schools in Schleswig-Holstein in Kronshagen (near Kiel), then he was retired.

Prof. Dr. **Bernd Kniehl** studied physics and mathematics at Karlsruhe and Cambridge, was private lecturer at the universities of Hamburg and Munich, and researcher at the Max Planck Institute for Physics. Since 1999 he is full professor of theoretical physics at the University of Hamburg. His research is dedicated to particle phenomenology.

Dipl.-Ing. **Norbert Job** Industrial Engineering and Management StudiesTH Darmstadt and Hamburg. Participation at the Job GmbH. In 1995 foundation of the Norbulb Sprinkler Elemente GmbH, manufacturer of thermally activating glass bulbs for sprinklers and other fire protection applications.

Head of Department i.R. **Günter Offermann** Teacher for physics, mathematics and computer science lessons, school lecturer and specialist lecturer in physics at the regional council in Stuttgart, from 1989 until retirement headmaster of the Friedrich Schiller Gymnasium in Marbach am Neckar.

Prof. Dr. **Peter Schmälzle** since 1995 Instructor for teaching Physics at the Staatliches Seminar für Didaktik und Lehrerbildung (Gymnasien) Karlsruhe (department for teacher training for higher education). Since 2005 Head of Department for Natural Sciences at aforementioned institute.

Dr. **Joachim Wegener** studied Chemistry in Göttingen and has been working 5 years for a research laboratory in Aachen and app. 30 years in electronic industry. His main focus was chemical analyses and engineering for production areas and environmental sustainability.

Members of the Council (September 2018)

Prof. Dr. **Wolfgang Bensch**
Director of the Institute of Inorganic Chemistry,
University of Kiel

Prof. **Hans U. Fuchs**, MSc
Institute of Applied Mathematics and Physics, Zurich University of Applied Sciences at Winterthur, Switzerland.

Prof. Dr. **Peter Häussler**
Institute of Physics,
Chemnitz University of Technology

Dr. **Georg Job**
Former Academic at the Institute of Physical Chemistry,
University of Hamburg

Prof. Dr. **Matthias Laukenmann**
Department of Physics and Didactics of Physics,
University of Education Ludwigsburg

OStD. Prof. **Josef Leisen**
Former Chairman of the Federal Training College for Secondary Schools Teachers, Koblenz

Dr. Dr. h.c. **Jürgen Lüthje**
Former President of the University of Hamburg

Prof. Dr. **Fritz Vahrenholt**
Former Senator of the Ministry of Environment in Hamburg and Chief Executive Officer of RWE Innogy GmbH. Since August 2012 sole chairman of the Deutsche Wildtier Stiftung.

Eduard-Job-Foundation for Thermo- and Matterdynamics

JOB STIFTUNG

sponsored by
Norbulb

Registered Office
Eduard-Job-Foundation
c/o NTU
Virchowstr. 17-19
22767 Hamburg

General Inguiries:
Tel +49-(0)-40/67996799
Fax +49-(0)-40/67996802
sekretariat@job-stiftung.de

www.job-stiftung.de

Postal Address:
Hollenbek 24
22339 Hamburg
Germany

Account for donations: Deutsche Bank AG Hamburg,
DE46 2007 0000 0015 7610 00, BIC DEUTDEHHXXX

Approved by the Senate of the Free and Hanseatic City of Hamburg on 14. January 2002

Last update: September 2018

Tasks and Goal

Thermodynamics

Thermodynamics is considered to be difficult. The historical development has given it an unusual structure that is hardly compatible with the conceptions of other areas of physics. To make it at all approachable, it uses numerous auxiliary constructs. However, a slightly altered approach and a careful choice of computational operations can produce a framework for teaching where the computations are drastically reduced and conform with everyday views and structures without loss of accuracy. The resulting intuitively simple approach permits the early introduction of thermodynamics in school.

Matterdynamics

Matterdynamics has not yet been established as an independent discipline. It mostly appears restricted to chemistry and dismembered into unrelated parts (quantum chemistry, chemical thermodynamics, chemical kinetics, optical spectroscopy, etc.). Matterdynamics actually has a structure analogous to that of thermodynamics. It can be represented as its sister science in a similarly uncomplicated manner. Moreover, it can be generalized and applied beyond the subject of chemistry.

Basic Principles

The approach pursued by the foundation is based upon a concept developed by Georg Job (Hamburg) and published in his book “A New Concept of Thermodynamics (Neudarstellung der Wärmelehre)” in 1972.

The starting point is the insight that the prescientific concept of quantity of heat directly yields what is called entropy today. Already in 1911, H. Callendar came to a similar conclusion by stating that Clausius’ entropy largely corresponds to Carnot’s caloric.

In his work, G. Job has demonstrated that a consistent theory of thermodynamics and matterdynamics can be developed by accepting entropy as heat (caloric). It encompasses both classical and statistical thermodynamics while being impressively clear, simple, succinct, and concise.

Features of the New Concepts

- Unified description of mechanical, electrical, thermal, and chemical systems
- Unified description of microscopic, macroscopic, reversible, irreversible, static and kinetic systems
- Short calculations that are clearly predictable and comprehensible and can be easily checked
- All quantities used have their counterpart in common sense reasoning
- The approach can be easily adapted to different educational levels
- The reduced effort for teaching and learning saves time and creates space for teaching new knowledge
- Integration of more than hundred simple but impressive demonstration experiments

Focus of the Foundation

The Foundation promotes measures and actions in education, research and business that serve the above mentioned goals. Examples:

- Events and research projects at universities and universities of applied sciences, funding of specific research programs
- Support for education and training of science teachers in general and technical secondary schools

In his work, G. Job has demonstrated that a consistent theory of thermodynamics and matterdynamics can be developed by accepting entropy as heat (caloric). It encompasses both classical and statistical thermodynamics while being impressively clear, simple, succinct, and concise.

Features of the New Concepts

- Unified description of mechanical, electrical, thermal, and chemical systems
- Unified description of microscopic, macroscopic, reversible, irreversible, static and kinetic systems
- Short calculations that are clearly predictable and comprehensible and can be easily checked
- All quantities used have their counterpart in common sense reasoning
- The approach can be easily adapted to different educational levels
- The reduced effort for teaching and learning saves time and creates space for teaching new knowledge
- Integration of more than hundred simple but impressive demonstration experiments

Focus of the Foundation

The Foundation promotes measures and actions in education, research and business that serve the above mentioned goals. Examples:

- Events and research projects at universities and universities of applied sciences, funding of specific research programs
- Support for education and training of science teachers in general and technical secondary schools

Georg Job studied chemistry at the University of Hamburg, where he received in 1968 his PhD degree supervised by Prof. A. Knappwost. He was a lecturer at the Institute of Physical Chemstry of the University of Hamburg from 1970 to 2001. Two guest lectureships brought him to the Department of Physics at the University of Karlsruhe (1979-80) and to Tongji University in Shanghai (1983).

Already as a student, Georg Job was looking for ways to make the abstract conceptual structure of thermodynamics easier to understand and thus easier to use. A skillfully chosen algorithm, which he presented in his PhD thesis in 1968, makes it possible to deduce the formulas that are important for many applications in a goal-oriented way. This approach not only reduced the computational effort *drastically* (!)– usually only one single line was sufficient– but made except for the total energy of the system all other energetic quantities with the corresponding formula apparatus superfluous.

A closer examination of the conceptual structure also showed:

1) The quantity entropy, which is considered to be especially difficult to grasp, has characteristics that correspond quite well to a layperson´s perception of the concept “amount of heat.”

2) The chemical potential, which is usually defined as the *partial molar Gibbs energy* of a substance in a mixed phase, can – skillfully presented – already be taught on secondary school level.

The fact that a consistent theory can be developed on such a basis was demonstrated in 1970 in a lecture entitled "Attempt to Redesign Thermodynamics.” The approach was so well received by the listeners that a number of them offered to compile lecture notes that– later supplemented–were published as a book by the German publishing house “Akademische Verlagsgesellschaft” in 1972. The concept was presented in numerous articles and lectures at national and international conferences in the following years.

- **Links**

https://www.job-foundation.org
https://www.facebook.com/JobFoundationPhysChem