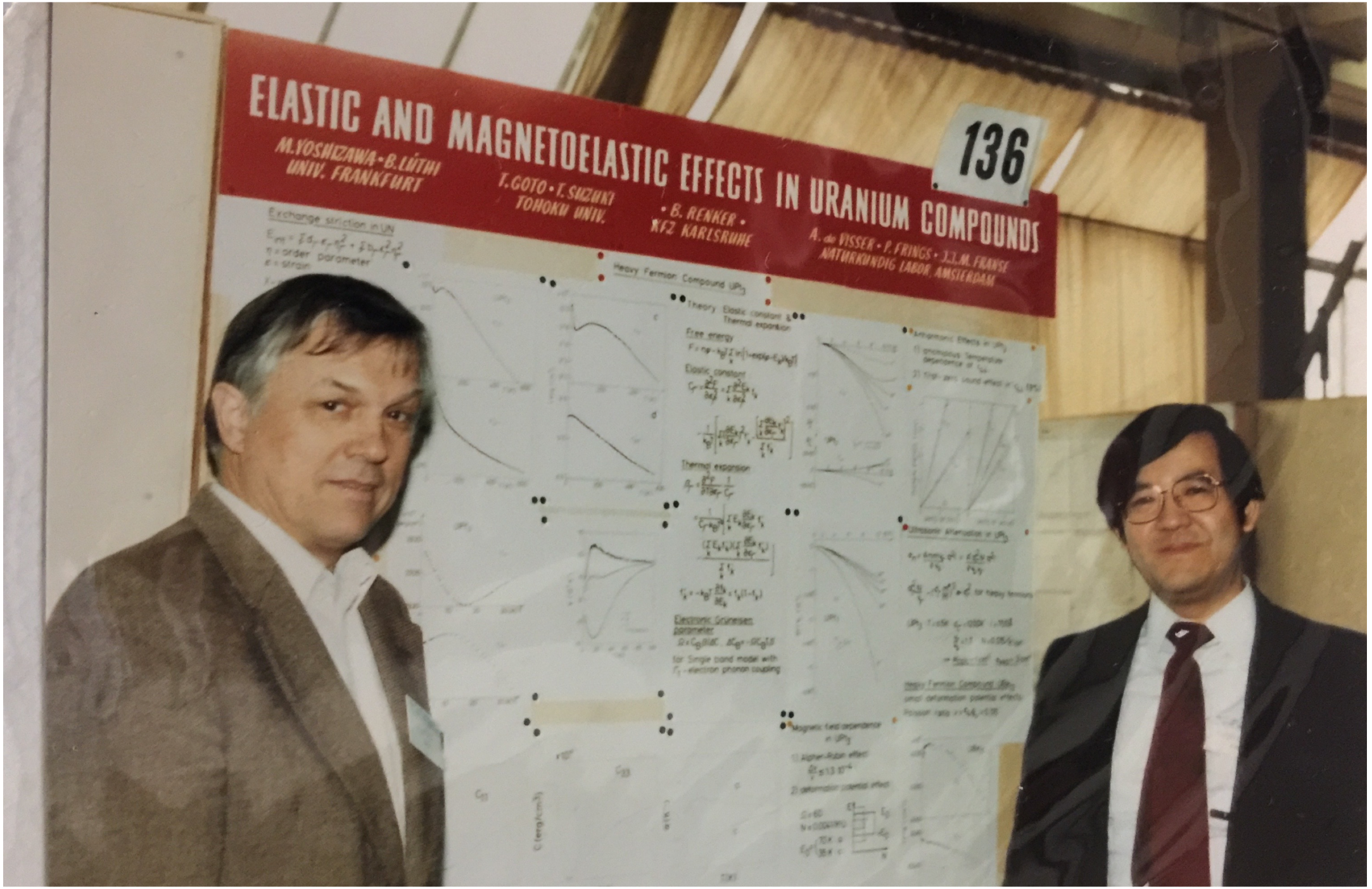
ELASTIC AND MAGNETOELASTIC EFFECTS IN URANIUM COMPOUNDS
136
M. YOSHIZAWA • B. LÜTHI
UNIV. FRANKFURT
T. GOTO • T. SUZUKI
TOHOKU UNIV.
• B. RENKER •
KFZ KARLSRUHE
A. de VISSER • P. FRINGS • J.J.M. FRANSE
NATUURKUNDIG LABOR, AMSTERDAM
Exchange striction in UN
η = order parameter
ε = strain
Heavy Fermion Compound UPt3
Theory Elastic constant &
Thermal expansion
Free energy
Elastic constant
Thermal expansion
Electronic Grüneisen parameter
for Single band model with
Γ1 - electron phonon coupling
Anharmonic Effects in UPt3
Ultrasonic Attenuation in UPt3
Magnetic field dependence
of UPt3
C (erg/cm3)

M. Yoshizawa in Frankfurt

After finishing his Ph.D. at Tohoku University in Sendai Dr. Yoshizawa came to the Goethe – University in Frankfurt to work in my group for about 2 years 1984 – 1986. This was an exciting time because we just started investigating heavy fermion compounds using ultrasonic methods and using also very high magnetic fields in the Grenoble high field laboratory. We concentrated at that time mainly on compounds like UPt_3, $CeRu_2Si_2$ and $CeCu_6$. Dr. Yoshizawa participated both experimentally and theoretically on various aspects.

Our ultrasonic setup allows to measure simultaneously velocity changes and sound attenuation. For slowly varying external parameters like the temperature one can keep the phase of one channel constant and one gets the frequency change and the quadrature signal. For pulsed magnetic fields with rise time in the ms region one has to perform the experiment at constant frequency and to calculate amplitude and velocity change.

Anomalous temperature dependence of the longitudinal sound velocity (bulk modulus) and thermal expansion indicated before a new type of strain-heavy electron coupling which can be characterised by a large Grüneisen parameter. Together with K.D.Schotte we could describe characteristic features of longitudinal sound propagation, thermal expansion and ultrasonic attenuation in heavy fermion compounds using this special deformation potential coupling [1]. This worked especially well in heavy fermion Uranium compounds where magneto-elastic coupling to crystal electric field states were absent.

New exciting effects were found with measurements of longitudinal sound waves in high magnetic fields. In UPt_3 and in $CeRu_2Si_2$ a strong softening of the sound velocity at the “metamagneticlike transition” at 20 Tesla and 8 Tesla respectively appeared. This could be described again quantitatively with the same Grüneisenparameters as used for the temperature dependence of sound velocity and thermal expansion [2].

Dr. Yoshizawa was very active in his time in Frankfurt. Apart from heavy fermion substances he investigated a number of other interesting U-compounds such as UPd_3 and UN [3]. During his time in Frankfurt he co-authored at least 7 research papers.

Going back to Japan Professor Yoshizawa continued research using mostly ultrasonic techniques. He and his students performed many beautiful experiments, the last ones on new superconducting compounds.

I wish Professor Yoshizawa a good retirement in good health and with new intellectual enterprises.
I also would like to thank Professor Yoshizawa and Mrs. Yoshizawa for their kind help they gave me in the last few weeks.

Bruno Lüthi, Zürich February 2018