OAK RIDGE NATIONAL LABORATORY

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ORNL**FOREIGN TRIP REPORT**

ORNL FTR-3765

DATE: October 5, 1990**SUBJECT:** Report of Foreign Travel of M. G. Payne, Photophysics Group,
Health and Safety Research Division**TO:** Alvin W. Trivelpiece**FROM:** M. G. Payne**PURPOSE:** To attend the Fifth International Symposium on Resonance Ionization
Spectroscopy and Its Applications in Varese, Italy.**SITES**

VISITED:	9/16-21/90	Fifth International Symposium on Resonance Ionization Spectroscopy and Its Applications	Varese, Italy	N. Omenetto
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ABSTRACT: The field of Resonance Ionization Spectroscopy grew out of work done in the Photophysics Group at Oak Ridge National Laboratory. As one of the original developers of this field the traveler has continued to attend this meeting on a regular basis. The traveler was originally asked to present an invited talk and to present part of a short course offered to graduate students attending the conference. Subsequently, the traveler was also asked to chair a session and to be a judge of the student papers entered in a contest for a \$1000 first prize.

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FIFTH INTERNATIONAL SYMPOSIUM ON RESONANCE IONIZATION
SPECTROSCOPY AND ITS APPLICATIONS
VARESE, ITALY
SEPTEMBER 16-21, 1990

The traveler gave an invited talk entitled "Large Collective Lamb Shifts in High Pressure Noble Gases." In addition, he presented a one-hour lecture (as part of a short school on Resonance Ionization Techniques offered for the large number of graduate students attending the meeting) on "Theory of Laser Ionization." Also, he was the chairperson for Session IV, Laser Ionization Mechanisms-Spectroscopy II, and served as a judge for a contest in which the best paper written by a graduate student was chosen.

The short course was attended by about 45 students and approximately 30 regular conference attendees. It is the traveler's impression that the course was well received. It was particularly gratifying that the number of graduate students attending the course was so large. To demonstrate the enthusiasm, it should be pointed out that the course was offered in the evening after the regular sessions from 8:30 a.m. to 5:30 p.m. had been held.

The contest for the best student paper was won by R. Hergenroder of the University of Dortmund, with a student from the University of Mainz finishing second. The student papers and posters were of excellent quality.

The traveler had the opportunity to talk at length with P. Lambropoulos, R. Wallenstein, P. M. Johnson, K. Niemax, T. Whittaker, H. J. Kluge, G. I. Bekov, H. F. Arlinghaus, D. W. Chandler, N. Omenetto, C. M. Miller, P. Benetti, P. Camus, C. E. Young, and K. W. D. Leddingham. These discussions were very valuable in connection with work being carried out for the Department of Energy at Oak Ridge National Laboratory (ORNL). The attendees included some of the best scientists on multiphoton ionization in the entire world.

The Photophysics Group at ORNL is currently planning a new line of work involving high resolution mass spectroscopy on very large biological molecules. In this work, a highly optimized reflectron type of time-of-flight mass spectrometer will be combined with soft ionization and fragmentation-free injection in order to study large molecules. One of the highlight talks at the meeting was by J. Grotemeyer of the University of Munich. Grotemeyer reported mass spectroscopy on large biological molecules in which he observed masses as large as 200,000 daltons.

In the last ten years, a large portion of the traveler's work has been related to nonlinear optics in the gas phase. Gas phase nonlinear optics has been used to extend the range over which tunable light can be generated from <100 nm through 1000 nm. One of the leaders in this field has been R. Wallenstein of the University of Hanover. Wallenstein told of a new parametric oscillator which is tunable from 200 nm to 5000 nm with good beam quality and bandwidth. This new advance is a potential replacement for dye lasers (and the related toxic waste). At present this device is still expensive because both the pump laser and the amplifier need to be injection locked in order to achieve good bandwidth. The traveler

talked at length with Wallenstein about his recent work and his plan to commercialize both the parametric oscillator and a gas (or vapor) cell for four-wave mixing. He hopes to market the latter device in the United States through Comstock of Oak Ridge, Tennessee.

During the past year, the traveler spent some of his time working on the effects of hyperfine structure on the accuracy with which isotope ratios can be determined by Resonance Ionization Mass Spectroscopy with broad bandwidth lasers. P. Lambropoulos has also addressed this problem. The traveler spent considerable time with him discussing the subtleties of this problem. Lambropoulos presented an invited paper on this topic at the meeting.

SUMMARY

This is always a very valuable meeting for members of the Photophysics Group at ORNL. The quantity and quality of work done at European Universities in this area of study is very impressive. The traveler believes that this was the best of the five biannual meetings held on the subject. Thanks to Gerald Goldstein of the Department of Energy whose financial support made this meeting possible.

APPENDIX

ITINERARY

September 15-16, 1990

Travel from Oak Ridge, Tennessee, to Varese, Italy

September 21-22, 1990

Travel from Varese, Italy, to Oak Ridge, Tennessee

PERSONS CONTACTED

<u>Name</u>	<u>Institution</u>
P. Lambropoulos	University of Southern California, USA
R. Wallenstein	University of Kaiserlautern, FDR
K. Niemax	University of Dortmund, FDR
H. J. Kluge	University of Mainz, FDR
P. M. Johnson	University of New York at Stony Brook, USA
D. W. Chandler	Sandia Laboratories, USA
C. M. Miller	Los Alamos National Laboratory, USA
T. Whittaker	Pacific Northwest Laboratory, USA
K. W. D. Leddingham	University of Glasgow, UK
N. Omenetto	Commission of the European Communities, Joint Research Center, Ispra Site, Italy
P. Agostini	Saclay, France
P. Camus	Laboratoire Aime Cotton, Orsay, France
C. E. Young	Argonne National Laboratory, USA
P. Benetti	University of Pavia, Italy
B. Lehmann	University of Bern, Switzerland
N. Thonnard	Atom Sciences, Inc., USA
H. F. Arlinghaus	Atom Sciences, Inc., USA

G. I. Bekov

USSR Academy of Sciences
Institute of Spectroscopy, USSR

B. A. Bushaw

Pacific Northwest Laboratory, USA

T. Gilbert

Univ. d'Orleans, France (student)

F. F. Karpeshin

Leningrad State University, USSR

A. W. McMahon

Harwell Laboratory, UK

R. Salomaa

Helsinki University of Technology, Finland

H. A. Schuessler

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