This grant provided travel and subsistence for scientists to attend and report research findings at the 9th International Symposium on Bioluminescence and Chemiluminescence, held at the conference facilities of the Marine Biological Laboratory, Woods Hole, MA from October 4 to 8, 1996. There were 256 persons registered and 169 abstracts submitted, all of which were published in the Journal of Bioluminescence and Chemiluminescence. The program was organized to have no parallel sessions except for one afternoon on education, so all attendees were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages.
OBJECTIVE: Provide travel and subsistence for scientists to attend and report research findings at the 9th International Symposium on Bioluminescence and Chemiluminescence.

APPROACH: The program was planned to embrace both basic science and applied research in bioluminescence and chemiluminescence. In addition to support from The Office of Naval Research, which was acknowledged in the program and publication, seven commercial sponsors and fifteen exhibitors contributed to the funding. An international scientific program committee aided by a US planning committee provided advice in all aspects of the organization and session planning. Their names are given in the first page of the meeting program (see Appendix).

The meeting was convened starting on Friday, October 4, 1996 with the final sessions on Tuesday, October 8. There were 256 persons registered, of whom about 15 were unable to attend at the last minute, and 169 abstracts submitted, all of which were published in the Journal of Bioluminescence and Chemiluminescence. The program of oral presentations, a copy of which is appended, was organized to have no parallel sessions except for one afternoon on education, so all attendees were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. Two poster sessions (47 and 48 posters) were scheduled with a two day hanging period and a designated time for discussion.

ACCOMPLISHMENTS: The symposium was characterized by attendees, including the several representatives from the Office of Naval Research, as highly informative and very productive in terms of reporting new findings, generating new relationships and stimulating new ideas. Among other things, the crystal structure of GFP was presented for the first time, and a representation of this structure was used as the cover illustration for the volume of papers published from this meeting. The abstracts were published in two issues of the Journal of Bioluminescence & Chemiluminescence (see Publications, below), covering topics ranging from theoretical chemistry to analytical applications of luminescence. The papers presented were published in a symposium volume edited by Hastings, Kricka and Stanley, which appeared and was distributed to all attendees less than five months after the meeting. The program officer at the Office of Naval Research was provided with a copy of this book.
SIGNIFICANCE:

Basic studies of bio- and chemi-luminescence have provided fundamental insights into chemical mechanisms. They have also facilitated the development of applications of luminescence in numerous diverse uses. In the last decade such developments have been rapid and effective. The use of bioluminescence for analytical specific detection of analytes has been well established and is widely used in biological and medical research. Luminescence also provides a marker that in many applications can and does replace radioactivity, as in the use of chemiluminescence for DNA sequencing. The most recent and most rapidly developing area is in following gene expression, for which several different luciferases have been employed (bacterial, firefly, coelenterate). The most widely used of such luminescent substances is green fluorescent protein, which occurs as a part of the bioluminescent system of a variety of jellyfish and other coelenterates. Thus studies of basic mechanisms in bioluminescence, as with numerous other areas of research, has led to many advances and applications in numerous other areas.

PUBLICATIONS


Appendix:
1) Four pages from the program booklet with listings of plenary lectures and oral research presentations.
WE GRATEFULLY ACKNOWLEDGE
Sponsor Support

International Science Foundation, N.Y.........Travel grants
EG & G Berthold, Wilbad, Germany ..........Marlene
DeLuca Prize
Dynatech Laboratories, Chantilly, VA ......Travel grant
Lumigen, Southfield, MI .........................Evening Mixer
MGM Instruments, Hamden, CT ..............Coffee break
Clontech Laboratories, Palo Alto, CA ........Coffee break
Lab Systems-Denley, Needham Hts. MA ......Coffee break

COMMERCIAL EXHIBITORS

Exhibit tables (by numbers; see floor plan); mailing
addresses are given at the back of the program.

(1) Packard Instrument Company, Inc.
(2) STRATEC Electronic GmbH
(3) Photek Limited
(4) Laboratory Technologies, Inc.
(5) Turner Designs, Inc.
(6) Boehringer Mannheim
(7,8) Wallac Inc., an EG&G Company
(7,8) EG&G Berthold
(9) Tropix, Inc.
(10) BMG Lab Technologies, Inc.
(11) Clontech Laboratories, Inc.
(12) Princeton Instruments, Inc.
(13) MGM Instruments, Inc.
(14) Universal Imaging Corporation
(15) Hamamatsu Photonic Systems

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Dunlap, P (Woods Hole, MA)
Kishi, Y (Cambridge, MA)
Prasher, D (Otis AFB, MA)
Reynolds, G (Princeton, NJ)
Shimomura, O (Woods Hole, MA)
Wilson, T (Cambridge, MA)
Ziegler, M (College Station, TX)
Program

Sessions in Lillie auditorium except where noted

Friday PM
Registration Desk open: 3PM to 11PM
(Late arrivals, get key from night watchman)

BUFFET SUPPER: Swope dining hall 6:00-9:30 PM
OPENING RECEPTION AND MIXER:
Meigs Room, Swope 9:30-11:00PM

Saturday AM Session 8:45 AM
Introductory remarks: J.W. Hastings, Organizer
Welcome to the MBL: Dr. John Burris, Director

• Chemistry & enzymology of light emitting reactions
  Co-chairs T. Wilson (US) and Y. Kishi (US)
• Mechanisms in chemiluminescence & bioluminescence:
  some unfinished business. (25 min) F. McCapra (UK)
• Low temperature photooxygenation of a coelenterate
  luciferin analog, synthesis and proof of 1,2-dioxetanone
  as luminescence intermediate. (20 min) M. Isobe (Japan)
• Chemiluminescence of Davis’ oxaziridine in the presence of
  strong bases. (20 min) M.N. Stojanovic and Y. Kishi (US)
• On the mechanism of the peroxyoxalate reaction: synthesis
  and chemiluminescence characteristics of an intermediate.
  (20 min) W.J. Baader (Brazil)

COFFEE BREAK 10:30-11:00
SPONSORED BY MGM Instruments, Hamden, CT

• Stability and reactivity of oxygenated luciferase-flavin
  intermediates. (20 min) S.-C. Tu (US)
• Mechanism of excited state production in bacterial bioluminescence.
  (20 min) S. Ghisla (Germany)
• The interaction of fluorescent antenna proteins with bacterial
  luciferase reaction intermediates. (20 min) J. Lee (US)
• Flavin reductase P: structural basis for the production of
  reduced flavin. (20 min) K.L. Krause (US)

LUNCH 12:30-1:30 PM Swope Dining Hall

Saturday PM Session 2PM
• Quorum sensing & regulatory elements controlling bacterial bioluminescence
  Co-chairs: E.P. Greenberg (US) and A. Eberhard (US)
• Intercellular signalling in marine Vibrio. (25 min) B.L. Bassler (US)
• The Vibrio fischeri LuxR-LuxI system, a model for quorum sensing in Gram-negative bacteria. (20 min)
  E.P. Greenberg (US)
• H-NS protein represses transcription of cloned lux system of V. fischeri and other luminous bacteria. (20 min)
  S. Ulitzur (Israel)
• The glucose-effect on bacterial bioluminescence seems to be partially due to inhibition of autoinducer synthase by
  protein EIIGlc. (15 min) U.K. Winkler (Germany)
• Insect pathogenic Xenorhabdus nematophilus may have an autoinducer regulatory system similar to Vibrio harveyi.
  (15 min) E.A. Meighen (Canada)
• Genetic study of chaperonin-bacterial luciferase interaction. (15 min) A.P. Escher (US)

Society Business Meeting: 4PM
Agenda items: Adoption of constitution and by laws
Election of Officers and Councilors
Selection of organizer and site for meeting in 1998

Saturday Posters and exhibits: open all day
Swope lobby & lounge, Floors 1 and 2:
(Posters’ organizer: Anatol Eberhard)

OPEN BAR: 5:00 PM
DINNER: Swope dining hall 6:00-7:30 PM

Saturday Evening Session 8PM
• Symbioses of luminous bacteria with higher organisms
  Co-chairs: K. Nealon and E. Widder
• The Euprymna scolopet/Vibrio fischeri symbiosis.
  The squid says: Margaret McFall-Ngai (US)
  The bacterium responds: Edward Ruby (US)

MIXER: Meigs Room, Swope 9:30-11:00PM
SPONSORED BY Lumigen, Inc. Southfield, MI
Sunday AM Session 9 AM
- Firefly luminescence and applications
  Chair: L. Kricka (US) and K. Wood (US)
- Chaperone DnaK and ATP participate in the in vivo folding of firefly luciferase synthesized by E. coli cells.
  (30 min) N.N. Ugarova (Russia)
- Structure of the catalytic site of firefly luciferase and bioluminescence color. (20 min) L. Brovko (Russia)
- Chemical modification of firefly luciferase (20 min) F. Leach (US)
- HIS-433 as a key residue for the color difference in firefly luciferase, Hotaria parvula. (20 min) H. Ueda (Japan)

COFFEE: 10:30-11:00
SPONSORED BY Clontech Laboratories, Palo Alto, CA
- Genetically engineered firefly luciferase as a label in immunoassays and gene probe assays. (20 min) D.J. Squillen (UK)
- Biotinylation of firefly luciferase in vivo: purification and immobilization of bifunctional recombinant luciferase. (20 min) C.Y. Wang (US)
- Co-reporter technology integrating firefly and Renilla luciferase assays. (20 min) B.A. Sherf (US)

LUNCH: 12:30-1:30 PM Swope Dining Hall

Sunday PM Concurrent Sessions
Session A: Lillie Auditorium 2PM
Luminescence in medicine & disease, clinical chemistry & microbiology, Chairs: P. Stanley (UK) and D.J. O’Kane (US)
- Introductory Remarks: Clinical utility of bioluminescence and chemiluminescence: basic research translated into clinical practice. (10 min) D.J. O’Kane (US)
- Application of fluorescence, bioluminescence, and chemiluminescence technologies to antibacterial drug susceptibility testing. (15 min) R. Cooksey (US)
- Native chemiluminescence of neutrophils from synovial fluid of patients with rheumatoid arthritis. (15 min) J. Arnhold (Germany)
- Chemiluminescence imaging as a bioanalytical tool (15 min) A. Roda (Italy)
- Lumigen™ APS: new substrates for the chemiluminescent detection of phosphatase enzymes (15 min) H. Akhavan-Tafti (US)
- Evaluation of the bioluminescence-enhanced zona binding assay. (15 min) W. Miska (Germany)
- The use of adenylate kinase for the detection and identification of low numbers of micro-organisms. (15 min) M.J. Murphy (UK)

Concurrent Session B: Whitman Lecture Hall 2PM
Luminescence in Science Education
Co-chairs: S. Albrecht (Germany) and J.D. Andrade (US)
- Transformation experiment using bioluminescence genes of Vibrio fisheri as a teaching tool. (15 min) J. Slock (US)
- Dr. Darwin’s curiosity shop and the sparkling science curiosity road show. (15 min) A.K. Campbell (UK)
- Bacterial bioluminescence in ecological education (15 min) V.A. Kratasyuk (Russia)
- Real Scientist: an educational kit using bioluminescent bacteria and CD-ROM. (15 min) P.E. Andreotti (US)
- A bioluminescence/chemiluminescence bibliographic database for research and education. (15 min) D.J. O’Kane (US)
- Applying bioluminescence to science education. (15 min) J.D. Andrade (US)

Society Business Meeting, second session: 4PM
Sunday Posters and exhibits: open all day, Swope lobby & lounge, Floors 1 and 2: (Posters’ organizer: J.-E. Rees)

OPEN BAR: 5:00 PM
DINNER: Swope dining hall 6:00-7:30 PM

Sunday Evening Session 8PM
- Aequorin and calcium imaging
  Co-chairs: A. Szalay (US) and O. Shimomura (US)
- Introductory remarks: Luciferase imaging in transformed cells and organisms. (10 min) A. Szalay (US)
- As time glows by: sleuthing the circadian clock mechanism with luminescent reporters (30 min) C.H. Johnson (US)
- Acquorin and calcium imaging (20 min) R. Crétro (US)
- Imaging recombinant aequorin, kinases and ATP in defined compartments of living cells. (20 min) A. Campbell (UK)

MIXER: Meigs Room, Swope 9:30-11:00PM

Monday AM Session 9AM
- Coelenterate luminescence, green fluorescent protein & applications Chairs: D. Prasher (US) and W. Ward (US)
- Introductory remarks (10 min) W. Ward (US)
- Recent advances in the use of green fluorescent protein as a genetic reporter. (30 min) P.A. Kitts (US)
- Quantitative imaging of green fluorescent protein. (20 min) D.W. Piston (US)
- GFP as a marker of a nuclear pore complex protein. (20 min) E. Hallberg (Sweden)

COFFEE: 10:30-11:00
SPONSORED BY Lab Systems-Denley, Needham Heights, MA
Monday PM Session 2PM

- The molecular structure of green fluorescent protein. (20 min) G.N. Phillips (US)
- Monitoring biofilm induced persistence of Mycobacterium in drinking water systems using GFP fluorescence. D. White (US)
- Characterization and applications of GFP mutants with enhanced fluorescence. (20 min) B. Cormack (US)
- Optimization of GFP as a marker for detection of bacterial environmental samples. (20 min) J.K. Jansson (Sweden)

LUNCH: 12:30-1:30 PM Swope Dining Hall

Monday Evening Banquet 7-9PM Swope Dining Hall

Master of Ceremonies: Woody Hastings
Guest of Honor: Eric Schram
Presentation of the Marlene De Luca Prize:
Anthony Campbell and Fritz Berthold

After dinner address:
Reflections on light. Kenneth Nealson

Tuesday AM Session 8:30 AM

Oceanic bioluminescence: physiology, functions and evolution
Chair: J.-M. Bassot (France) and J. Case (US)
- Bioluminescent signals and systems: variety is the spice of light. (30 min) P.J. Herring (UK)
- The microscopical structure of the bioluminescence system in the medusa Periphylla periphylla. (20 min) P.R. Flood (Norway)
- Bioluminescent responses of the scyphozoan Periphylla periphylla from a Norwegian fjord. (video) (20 min) P.J. Herring (UK)
- In situ video recordings of bioluminescent displays in the Gulf of Maine. (20 min) E.A. Widder (US)
- Pholas dactylus, the remarkable mollusc. (video) (20 min) J. Knight (UK)

COFFEE: 10:00-10:30

- The dark side of marine bioluminescence: a novel non-luminescent function for coelenterazine. (20 min) J.-F. Rees (Belgium)
- The bioluminescent field of the Atlantic Ocean. (20 min) R. Williams (UK)
- The estimation of plankton biomass distribution in the layer of 0-100 meters by bioluminescent field parameters. (20 min) J.A. Rudjakov (Russia)
- The bioluminescence field as an indicator of the spatial structure of the planktonic community of the Mediterranean Sea basin. YuN. Tokarev (Ukraine)

Bag lunches provided for all participants

PM Trip on MBL collecting boat 2PM ($25; by sign up only)