Second Source to the Solection of Information 1 summated to sweets 1 hour for resource, notating to time of orthogeneous sources to the sources of t	REPORT DOCUMENTATION PAGE			OMB No. 0704-0188	
	ublic reporting burden for this collection of in	formation is estimated to average 1 hour pe	ar response, including the time	for reviewing instructions, searching exis	
AGENCY USE ONLY (LANVE MARK) I Jan 98 Final report 15 July 1996-14 Final report 15 July 199 Final report 199 Final report 1996-14 Final	attering and maintaining the data needed, an	d completing and reviewing the collection o	of information. Send comments	s regarding this burden estimate or any ot	
1 Jan 98 Final report 15 July 1996-14 A. TITLE MOD SUMTINE A. SYMPOSIUM ON BIOLUMINESCENCE & Chemiluminescence 8. PERFORMING NUMBERS A. SYMPOSIUM ON BIOLUMINESCENCE & Chemiluminescence 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESSIES 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESSIES J. WOOdland Hastings 9. PERFORMING ORGANIZATION NAME(S) AND ADDRESSIES 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESSIES Harvard University Department of Molecular and Cellular Biology 16 Divinity Avenue, Cambridge, MA 02138 a. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESSIES 10. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESSIES Office of Naval Research 800 N. Quincy Street Arlington, V& 22217-5000 10. SPONSORING / MONITOR NAME(S) AND ADDRESSIES 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT 12. DISTRIBUTION / AVAILABILITY STATEMENT 12. DISTRIBUTION / AVAILABILITY STATEMENT 13. AASTRACT AMAGINATION MARKES 11. SUPPLEMENTARY NOTES 13. AASTRACT AMAGINATION / AVAILABILITY STATEMENT 12. DISTRIBUTION / AVAILABILITY STATEMENT 13. AASTRACT AMAGINATION / AVAILABILITY STATEMENT 12. DISTRIBUTION / AVAILABILITY STATEMENT 14. SUBSTRACT AMAGINATION / AVAILABILITY STATEMENT 12. DISTRIBUTION / AVAILABILITY STATEMENT 13. AASTRACT AMAGINATION / AVAILABILITY ST	. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND	DATES COVERED	
A. WITH AND SUMMER S A. SYMPOSIUM ON Bioluminescence & Chemiluminescence 3. AUTHORIS) J. WOOGland Hastings 7. PERFORMING ORGANIZATION NAMELS) AND ADDRESS(ES) Harvard University Department of Molecular and Cellular Biology 16 Divinity Avenue, Cambridge, MA 02138 3. SPONSORING / MONTORING AGENCY NAMELS) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy Street Arlington, VA 22217-5000 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABLITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABLITY STATEMENT Distribution unlimited 13. ASSTRACT (Maching 200 word) 14. SUPPLEMENTARY NOTES 14. SUBJECT TEMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Repeated domains 14. SUBJECT TEMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Repeated domains 15. SECURTY CLASSFICATION 16. SUBJECT TEMS 17. SECURTY CLASSFICATION 18. SECURTY CLASSFICATION 19. SECURTY CLASSFICATION 10. SECURTY CLASSFICATION 10. LMITATION 10. SECURTY CLASSFICATION 10. LMITATION 11. SUPPLEMENTAL 12. DISTRIBUTION CLASSFICATION 13. SECURTY CLASSFICATION 14. SUBJECT TEMS 15. RUMBER 1		1 Jan 98	Final report	15 July 1996-14 Ju	
A symposium on Bioluminescence & Chemiluminescence A. ANTHORS: J. Woodland Hastings J. Woodland Hastings A anthons: J. Woodland Hastings A symposium on Bioluminescence Harvard University Department of Molecular and Cellular Biology 16 Divinity Avenue, Cambridge, MA 02138 a. seonsoning Additional Research 800 N. Quincy Street Arlington, VA 22217-5000 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABULTY STATEMENT Distribution unlimited 13. ANSTRACT (Medimum 200 month) 14. SUPPLEMENTARY NOTES 15. ANSTRACT (Medimum 200 month) 15. ANSTRACT (Medimum 200 month) 16. SPONSORING / MANUALABULTY STATEMENT Distribution unlimited 15. ANSTRACT (Medimum 200 month) 16. ANSTRACT (Medimum 200 month) 17. Supplementer and 169 abstracts submitted, all of which were published in the Journal of Bioluminescence and Chemiluminescence. The program was organized to have no parall sessions except for one afternoon on education, so all attend were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TEMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Repeated domains 19. SECURTY CLASSFECATION Period Parameter Para	. TITLE AND SUBTITLE	· · ·		5. FUNDING NUMBERS	
	A symposium on Biolu	minescence & Chemily	minescence		
J. Woodland Hastings 7. PENFORMING ORGANIZATION NAME(S) AND ADDRESSIES) Harvard University Department of Molecular and Cellular Biology 16 Divinity Avenue, Cambridge, MA 02138 8. SPONSORING / MONTORING AGENCY MAME(S) AND ADDRESSIES) Office of Naval Research 800 N. Quincy Street Arlington, VA 22217-5000 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 13. ASSTRACT / Maximum 200 words/ 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, Woo Hole A from October 4 to 8, 1966. There were 256 persons registered and 169 abstracts submitted, all of which were published in the Journal of Bioluminescence and Chemiluminescence and Chemiluminescence. The program was organized to have no parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TEMMS 15. NUMERON 15. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 16. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION	AUTHOR(S)				
	J. Woodland Hasting	S			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 16. Divinity Avenue, Cambridge, MA 02138 10. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 0. Office of Naval Research 800 N. Quincy Street 10. SPONSORING / MONITOR 800 N. Quincy Street Arlington, VA 22217-5000 12. DISTRIBUTION / AVAILABILITY STATEMENT 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT 12. DISTRIBUTION CODE 13. ABSTRACT (Maximum 200 words) 13. ABSTRACT (Maximum 200 words) 13. ADDITION OF CODE 13. ABSTRACT (Maximum 200 words) 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 th conference facilities of the Marine Biological Laboratory, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 15. NUMBER OF A COVERAGE AND ADDRESS (ADDRESS) 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll protein and the profile of the Mare profile CASSIFICATION (CASSIFICATION ADDRESS) 12					
Harvard University Department of Molecular and Cellular Biology 16 Divinity Avenue, Cambridge, MA 02138 10. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESSIES) Office of Naval Research 800 N. Quincy Street Arlington, VA 22217-5000 10. SPONSORING / MONITO AGENCY REPORT NUMMER 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12b. DISTRIBUTION CODE 13. ABSTRACT (Maximum 200 words) 12b. DISTRIBUTION CODE 14. SUBJECT TEMES 12b. DISTRIBUTION CODE 15. MOMER and report research findings at the 9th International Symposium on Bioluminescence and Chemiluminescence, held at th conference facilities of the Marine Biological Laboratory, Woo 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TEMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote n Generation of Coverages. 15. NUMBER OF n 24. SUBJECT TEMS 15. RUMBER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll prote n 20. UNITATION OF ABSTRACT CLASSIFICATION 20. UNITATION 20. UNITATION		E(S) AND ADDRESS(ES)	•	8. PERFORMING ORGANIZATION	
Department of Molecular and Cellular Biology 16 Divinity Avenue, Cambridge, MA 02138 16 Divinity Avenue, Cambridge, MA 02138 a. sponsoring / MONTONING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy Street Arlington, VA 22217-5000 10. SPONSORING / MONITO AGENCY REPORT NUME 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12b. DISTRIBUTION CODE 13. ABSTRACT (Maximum 200 words) 12b. DISTRIBUTION CODE 13. ABSTRACT (Maximum 200 words) 12b. DISTRIBUTION CODE 14. SUBJECT TEMES 12b. DISTRIBUTION CODE 15. MUMES OF the State of the Marine Biological Laboratory, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TEMMS 15. NUMEER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll prote n . 2 + Repeated domains 14. SUBJECT TEMMS 15. NUMEER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll prote n . 2 + Repeated domains 15. NUMEER OF Bioluminescence in the second of the sec	Harvard University		``	REPORT NUMBER	
16 DIVINITY AVERUE, Cambridge, MA 02138 a. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy Street Arlington, VA 22217-5000 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 13. ABSTRACT (Maximum 200 words) 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 tr conference facilities of the Marine Biological Laboratory, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Repeated domains 15. NUMBER OI n. 2.4 16. PRICE CODI	Department of Molec	ular and Cellular Bio	ology		
a. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy Street Arlington, VA 22217-5000 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 13. ABSTRACT (Maximum 200 words) 14. ADDRESS(ES) 15. ABSTRACT (Maximum 200 words) 15. ABSTRACT (Maximum 200 words) 16. Generation of the marine Biological Laboratory, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Repeated domains 15. NUMBER OF COMPARISON 10. SECURITY CLASSIFICATION 16. SECURITY CLASSIFICATION 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. UMITATION 20. UMITATION	16 Divinity Avenue,	Cambridge, MA 02138			
a. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy Street Arlington, VA 22217-5000 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABILITY STATEMENT 13. ABSTRACT (Meximum 200 words) 13. ABSTRACT (Meximum 200 words) 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, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TEAMS 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 20. UMITATION				· · · · ·	
Address Address Arlington, VA 22217-5000 Address 11. SUPPLEMENTARY NOTES 12b. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12b. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12b. DISTRIBUTION CODE 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12b. DISTRIBUTION CODE 12. DISTRIBUTION / AVAILABILITY STATEMENT 12b. DISTRIBUTION CODE 12b. DISTRIBUTION CODE <td colspan<="" td=""><td>. SPONSORING / MONITORING AGEN</td><td>ICY NAME(S) AND ADDRESS(ES)</td><td><u></u></td><td>10. SPONSORING / MONITORIN</td></td>	<td>. SPONSORING / MONITORING AGEN</td> <td>ICY NAME(S) AND ADDRESS(ES)</td> <td><u></u></td> <td>10. SPONSORING / MONITORIN</td>	. SPONSORING / MONITORING AGEN	ICY NAME(S) AND ADDRESS(ES)	<u></u>	10. SPONSORING / MONITORIN
800 N. Quincy Street Arlington, VA 22217-5000 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 13. ASSTRACT (Maximum 200 words) 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 th conference facilities of the Marine Biological Laboratory, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll protein Repeated domains 15. NUMBER OF n. 24 16. PRICE CODI OF ABSTRACT	Office of Naval Res	earch		AGENCY REPORT NUMBER	
ATLINGTON, VA 2221/-5000 11. SUPPLEMENTARY NOTES 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 13. ABSTRACT (Maximum 200 words) 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 th conference facilities of the Marine Biological Laboratory, Woo 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Repeated domains 15. NUMBER OF DISTRIBUTION CLASSIFICATION DISTRIBUTION CLASSIFICATION OF ABSTRACT 20. LIMITATION	800 N. Quincy Stree	t			
11. SUPPLEMENTARY NOTES 12a. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution unlimited 13. ABSTRACT (Mextmum 200 words) 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, Woothole, 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 parall sessions except for one afternoon on education, so all attended were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS 15. NUMBER OF NUMBER OF NUMBER OF ABSTRACT 15. SECURITY CLASSIFICATION OF ABSTRACT 18. SECURITY CLASSIFICATION OF ABSTRACT	Ariington, VA 22217	-5000			
13. ABSTRACT (Maximum 200 words) 13. ABSTRACT (Maximum 200 words) 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 tr conference facilities of the Marine Biological Laboratory, Wood 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 parall sessions except for one afternoon on education, so all attended were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS 15. NUMBER OF ABSTRACT 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LUMITATION					
13. ABSTRACT (Maximum 200 words) 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, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS 15. NUMBER OF NUMBER OF ABSTRACT 14. SUBJECT TERMS 15. NUMBER OF NUMBER OF ABSTRACT 14. SUBJECT TERMS 18. SECURITY CLASSIFICATION 12. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 13. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 14. SUBJECT TERMS 19. SECURITY CLASSIFICATION 15. PRICE CODE 19. SECURITY CLASSIFICATION					
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, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS 15. NUMBER OF NUM			1999	0326 036	
attend and report research findings at the 9th International Symposium on Bioluminescence and Chemiluminescence, held at the conference facilities of the Marine Biological Laboratory, Wood 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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 24 15. NUMBER OF NEW PORT CLASSIFICATION OF ARSTRACT 15. NUMBER OF NEW PORT CLASSIFICATION OF ARSTRACT 17. SECURITY CLASSIFICATION OF ARSTRACT 18. SECURITY CLASSIFICATION OF ARSTRACT 20. LIMITATION	13. ABSTRACT (Meximum 200 words)	1	1999	0326 036	
Symposium on Bioluminescence and Chemiluminescence, held at the conference facilities of the Marine Biological Laboratory, Woold 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 parallasesions except for one afternoon on education, so all attended were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS 15. NUMBER OF Network and the presentation of the plenary talks with broader coverages. 14. SUBJECT TERMS 15. NUMBER OF Network and the plenary talks with broader coverages. 14. SUBJECT TERMS 15. NUMBER OF Network and the plenary talks with broader coverages. 14. SUBJECT TERMS 16. PRICE CODE 15. NUMBER OF Network and the plenary talks and the plenary talks and the plenary talks are plenary talks. 19. SECURITY CLASSIFICATION of ABSTRACT 17. SECURITY CLASSIFICATION OF ABSTRACT 18. SECURITY CLASSIFICATION of ABSTRACT 20. LIMITATION	13. ABSTRACT (Maximum 200 words, This grant provi	, ded travel and sub	1999	0326 036	
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 parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 12. SECURITY CLASSIFICATION 13. SECURITY CLASSIFICATION 14. SUBJECT TERMS 15. NUMBER OF 16. PRICE CODE 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor	ded travel and sub t research finding	1999 sistence for s at the 9th	0326 036 scientists to International	
registered and 169 abstracts submitted, all of which were published in the Journal of Bioluminescence and Chemiluminescence. The program was organized to have no parall sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll prote Repeated domains 15. NUMBER OF 16. PRICE CODE 17. SECURITY CLASSIFICATION OF ABSTRACT 17. SECURITY CLASSIFICATION OF ABSTRACT 18. SECURITY CLASSIFICATION OF ABSTRACT 20. LIMITATION	13. ABSTRACT (Meximum 200 words, This grant provi attend and repor Symposium on Bio conference facil	ded travel and sub t research finding luminescence and C ities of the Marin	esistence for s at the 9th chemiluminesce e Biological	scientists to International ence, held at the	
14. SUBJECT TERMS 15. NUMBER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 15. NUMBER OF 16. PRICE CODE 17. SECURITY CLASSIFICATION OF REPORT 18. SECURITY CLASSIFICATION OF THIS PAGE 19. SECURITY CLASSIFICATION OF ABSTRACT 20. LIMITATION	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996	esistence for s at the 9th hemiluminesce e Biological . There were	scientists to International ence, held at the Laboratory, Wood 256 persons	
sessions except for one afternoon on education, so all attende were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION 11. SECURITY CLASSIFICATION 12. SECURITY CLASSIFICATION 13. SECURITY CLASSIFICATION 14. SUBJECT TERMS 15. NUMBER OF 16. PRICE CODE 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi	sistence for s at the 9th hemiluminesce e Biological . There were tted, all of	0326 036 scientists to International ence, held at the Laboratory, Wood 256 persons which were	
were able to attend all presentations. Evening sessions were devoted to plenary talks with broader coverages. 14. SUBJECT TERMS Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION 20. LIMITATION	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was	sistence for s at the 9th hemiluminesce e Biological . There were tted, all of inescence and organized to	scientists to International ence, held at the Laboratory, Wood 256 persons which were	
14. SUBJECT TERMS 15. NUMBER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 14. SUBJECT TERMS Repeated domains 15. NUMBER OF 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 0F REPORT 0F THIS PAGE	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon	1999 esistence for the esistence for the esistence for the esistence for the esistence for the esistence for the esistence for the esistence for the esistence for the esist	scientists to International ence, held at the Laboratory, Wood 256 persons which were have no parallel so all attendee	
14. SUBJECT TERMS 15. NUMBER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll prote 17. Security classification 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 05 REPORT 05 ABSTRACT	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to attende	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati	1999 esistence for the sat the 9th themiluminesce the Biological There were tted, all of tinescence and organized to on education, ons. Evening	scientists to International ence, held at the Laboratory, Wood 256 persons which were have no parallel so all attendees sessions were	
14. SUBJECT TERMS 15. NUMBER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 14. Subject Terms Repeated domains 15. NUMBER OF 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 0F REPORT 0F THIS PAGE	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to atte devoted to plena	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati ry talks with broa	1999 esistence for as at the 9th themiluminesce e Biological . There were tted, all of inescence and organized to on education, ons. Evening der coverages	scientists to International ence, held at the Laboratory, Wood 256 persons which were have no paralle so all attendees sessions were	
14. SUBJECT TERMS 15. NUMBER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 2 + Repeated domains 16. PRICE CODE 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION 0F REPORT 0F THIS PAGE 0F ABSTRACT 20. LIMITATION	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to atte devoted to plena	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati ry talks with broa	1999 sistence for s at the 9th hemiluminesce e Biological . There were tted, all of inescence and organized to on education, ons. Evening der coverages	scientists to International ence, held at the Laboratory, Woods 256 persons which were have no parallel so all attendees sessions were	
14. SUBJECT TERMS 15. NUMBER OF Bioluminescence, dinoflagellates, peridinin-chlorophyll protein 2 + Repeated domains 16. PRICE CODI 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION 0F REPORT 0F THIS PAGE 0F ABSTRACT 20. LIMITATION	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to atte devoted to plena	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati ry talks with broa	1999 sistence for a the 9th hemiluminesce Biological There were tted, all of inescence and organized to on education, ons. Evening der coverages	scientists to International ence, held at the Laboratory, Woods 256 persons which were have no parallel so all attendees sessions were	
Repeated domains 16. PRICE CODE 17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION OF REPORT OF THIS PAGE	13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to atte devoted to plena	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati ry talks with broa	1999 sistence for s at the 9th hemiluminesce e Biological . There were tted, all of inescence and organized to on education, ons. Evening der coverages	scientists to International ence, held at the Laboratory, Woods 256 persons which were have no parallel so all attendees sessions were	
17. SECURITY CLASSIFICATION 18. SECURITY CLASSIFICATION 19. SECURITY CLASSIFICATION 20. LIMITATION OF REPORT OF THIS PAGE OF ABSTRACT	 13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to atte devoted to plena 14. SUBJECT TERMS Bioluminescence, d 	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati ry talks with broa	1999 esistence for at the 9th chemiluminesce e Biological . There were tted, all of inescence and organized to on education, ons. Evening der coverages	scientists to International ence, held at the Laboratory, Woods 256 persons which were have no parallel so all attendees sessions were 15. NUMBER OF PA	
OF REPORT OF THIS PAGE OF ABSTRACT	 13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to atte devoted to plena 14. SUBJECT TERMS Bioluminescence, d Repeated domain 	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati ry talks with broa	1999 esistence for the sat the 9th themiluminesce e Biological . There were tted, all of inescence and organized to on education, ons. Evening der coverages	0326 036 scientists to International ence, held at the Laboratory, Wood 256 persons which were have no parallel so all attendees sessions were 15. NUMBER OF P 11 prote n 2 + 4 16. PRICE CODE	
	 13. ABSTRACT (Maximum 200 words, This grant provi attend and repor Symposium on Bio conference facil Hole, MA from Oc registered and 1 published in the Chemiluminescence sessions except were able to atte devoted to plena 14. SUBJECT TERMS Bioluminescence, d Repeated domain 	ded travel and sub t research finding luminescence and C ities of the Marin tober 4 to 8, 1996 69 abstracts submi Journal of Biolum e. The program was for one afternoon end all presentati ry talks with broa	1999 esistence for s at the 9th chemiluminesce e Biological . There were tted, all of inescence and organized to on education, ons. Evening der coverages	0326 036 scientists to International ence, held at the Laboratory, Woods 256 persons which were have no parallel so all attendees sessions were 15. NUMBER OF PA 16. PRICE CODE	

GRANT #: N00014-96-1-1103

FINAL REPORT

PRINCIPAL INVESTIGATOR: Dr. J. Woodland Hastings

<u>INSTITUTION</u>: Harvard Univ., Dept Molecular & Cellular Biology

GRANT TITLE: A Symposium on Bioluminescence & Chemiluminescence

REPORTING PERIOD: 15 July 1996- 14 July 1997

AWARD PERIOD: 15 July 1996- 14 July 1997

<u>OBJECTIVE</u>: Provide travel and subsistence for scientists to attend and report research findings at the 9th International Symposium on Bioluminescence and Chemiluminescence.

<u>APPROACH:</u> 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.

DTIC QUALITY INSPECTED 4

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 areass.

PUBLICATIONS

Hastings, J. W., Kricka, L. J. and Stanley, P. E. (Editors) (1997) Bioluminescence and Chemiluminescence: Molecular Reporting with Photons. Proceedings of the 9th International Symposium. John Wiley & Sons, Chichester 568pp.

Abstracts, 9th International Symposium on Bioluminescence & Chemiluminescence, Marine Biological Laboratory, Woods Hole, MA., 4-8 October, 1996. J. Biolumin Chemilumin (1996) 11: 231-265.

Abstracts, 9th International Symposium on Bioluminescence & Chemiluminescence, Marine Biological Laboratory, Woods Hole, MA., 4-8 October, 1996. J. Biolumin Chemilumin (1997) 12: 21-31.

Appendix:

1) Four pages from the program booklet with listings of plenary lectures and oral research presentations.

9th INTERNATIONAL SYMPOSIUM on BIOLUMINESCENCE & CHEMILUMINESCENCE

Woods Hole MA • October 4-8, 1996

SYMPOSIUM SECRETARIAT: Professor J. Woodland Hastings, Chairman, Karen A. Christians, Secretariat Harvard University, 16 Divinity Ave., Cambridge, MA 02138

> Supported in part by a Grant from: THE OFFICE OF NAVAL RESEARCH

WE GRATEFULLY ACKNOWLEDGE _____SPONSOR SUPPORT_____

International Science Foundation, N.Y......Travel grants EG & G Berthold, Wilbad, GermanyMarlene DeLuca Prize Dynatech Laboratories, Chantilly, VATravel grant Lumigen, Southfield, MI......Evening Mixer MGM Instruments, Hamden, CTCoffee break Clontech Laboratories, Palo Alto, CACoffee break Lab Systems-Denley, Needham Hts. MACoffee 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 LabTechnologies, Inc.

- (11) Clontech Laboratories, Inc.
- (12) Princeton Instruments, Inc.
- (13) MGM Instruments, Inc.
- (14) Universal Imaging Corporation
- (15) Hamamatsu Photonic Systems

. INTERNATIONAL SCIENTIFIC ____ PROGRAM COMMITTEE ___

Hastings, JW (USA) CHAIRMAN

Allen, R (USA) Baldwin, T (USA) Bassot, J-M (France) Berthold, A (Germany) Campbell, A (UK) Case, J (USA) Egorov, A (Russia) Gitleson, J (Russia) Grant, P (UK) Kricka, LJ (USA) Knight, M (UK) Lundin, A (Sweden) McCapra, F (UK) Meighen, E (Canada)

Nicolas, J-C (France) Nicolas, M-T (France) O'Kane, D (USA) Pazzagli, M (Italy) Roda, A (Italy) Schaap, P. (USA) Schram, E (Belgium) Stanley, P (UK) Stewart, G (UK) Szalay, A (USA) Tsuji, A (Japan) Ugarova, N (Russia) Ulitzur, S (Israel) Wood, K (USA)

and the state of the state

LOCAL (US) COMMITTEE

Baldwin, T (College Station, TX) Bronstein, I (Bedford, MA) 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)

9th INTERNATIONAL SYMPOSIUM on BIOLUMINESCENCE & CHEMILUMINESCENCE

Marine Biological Laboratory • Woods Hole, MA • October 4-8, 1996

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 (UŠ)
- 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 EIIA^{Glc}. (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. Nealson and E. Widder
- The Euprymna scolopes/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

4

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. Squirrell (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 untility 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 fischeri* 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.-F. 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)
- Aequorin and calcium imaging (20 min) R. Créton (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

- 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 PM Session 2PM

• Luminescent reporter genes in cell biology and analytical applications

Chair: I. Bronstein & G. Sayler

- Bioluminescent bioreporters for toxicant detection, and bioavailability and biodegradation assessment (20 min) G.S. Sayler (US)
- Measurement of bioluminescence in single bacterial cells: application to biofilm research (20 min). R.J. Palmer (US)
- Chemiluminescence imaging as a bioanalytical tool. (15 min) P. Pasini (Italy)

Break

- Combined luminescent assays for multiple enzymes. (20 min) I. Bronstein (US)
- Applications of luminous oxidative stress biosensors: understanding disinfectants mode of action (15 min) S. Belkin (Israel)
- Chemiluminescence determination of catalase at physiological H₂O₂ concentrations. (15 min) S. Mueller (Germany)
- Real-time sequence-based DNA analyses using bioluminescences (15 min) P. Nyrén (Sweden)
- Bioluminescent multienzymic toxicity tests: methods, problems and advantages. (15 min) V. Kratasyuk (Russia)

Monday Posters and exhibits: open all day

Swope lobby & lounge, Floors 1 and 2: (Posters' organizer: S.-C. (David) Tu)

OPEN BAR: 5:00 PM

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)