ROLAND A. KNAPP

Sierra Nevada Aquatic Research Laboratory &
Earth Research Institute, University of California - Santa Barbara

roland.knapp@ucsb.edu | mountainlakesresearch.com | GitHub | ORCID

RESEARCH INTERESTS

- Resistance and resilience of aquatic ecosystems to anthropogenic stressors, in particular, emerging infectious diseases and nonnative species.
- Impacts of nonnative species on the structure and function of aquatic ecosystems.
- Developing effective strategies to recover endangered amphibians.

EDUCATION

University of California - Santa Barbara: *Ph.D. in Biology*	1992
University of California - Santa Barbara: *B.A. in Aquatic Biology*	1986

ACADEMIC APPOINTMENTS

Earth Research Institute, UC Santa Barbara: *Research Biologist*	2017-present
Marine Science Institute, UCSB: *Research Biologist*	2009-2017
Marine Science Institute, UCSB: *Associate Research Biologist*	2004-2009
Marine Science Institute, UCSB: *Assistant Research Biologist*	1993-2004
Marine Science Institute, UCSB: *Postdoctoral Researcher*	1992-1993
Dept. of Biological Sciences, UCSB: *Lecturer*	1991
Marine Science Institute, UCSB: *Graduate Research Assistant*	1989-1991
Dept. of Biological Sciences, UCSB: *Graduate Teaching Assistant*	1989-1991

HONORS & AWARDS

UCSB Dissertation Fellowship	1991
UCSB General Affiliates Fellowship	1989
Phi Beta Kappa, UCSB	1986

PROFESSIONAL ORGANIZATIONS

Ecological Society of America

PROFESSIONAL ACTIVITIES

Reviewer:

- Journals: American Naturalist, Amphibia-Reptilia, Animal Behaviour, Animal Conservation, Behavioral Ecology, Biological Conservation, Bulletin of Marine Science, Canadian Journal of Fisheries and Aquatic Sciences, Conservation Biology, Copeia, Diseases of Aquatic Organisms, Diversity and Distributions, Ecography, EcoHealth, Ecological Applications, Ecological

Monographs, Ecology, Ecology and Evolution, Ecology Letters, Ecosphere, Ecosystems, Environmental Biology of Fishes, Freshwater Biology, Herpetological Conservation and Biology, Herpetologica, Herpetological Conservation and Biology, Herpetological Review, Journal of Animal Ecology, Journal of Applied Ecology, Journal of Fish Biology, Journal of Herpetology, Journal of Zoology, Limnology and Oceanography, North American Journal of Fisheries Management, New Zealand Journal of Marine and Freshwater Research, Oecologia, PeerJ, PLOS One, Science, Science of the Total Environment, Scientific Report, Transactions of the American Fisheries Society.

- National Science Foundation: Grant proposals to the Division of Environmental Biology and Division of Integrative Organismal Systems.
- Other agencies: Grant proposals to the Alberta Conservation Association Grants in Biodiversity, Austrian Academy of Sciences – Earth Systems Sciences.
- U.S. Fish and Wildlife Service: Species status assessments for taxa being considered for listing under the U.S. Endangered Species Act, recovery plans for listed species.

Scientific Advisor:

- Technical Advisory Committee & Technical Team: Assisted the U.S. Fish and Wildlife Service, U.S. Forest Service, California Department of Fish and Wildlife, and National Park Service in developing a conservation assessment and developing and updating a conservation strategy for the mountain yellow-legged frog (1999-present).

Consultant:

- Chevron Guadalupe Restoration Project - Garcia and Associates: Analyzed long-term trends in California red-legged frog populations at the Guadalupe Dunes project site (with Maxwell Joseph; 2018-2019).
- California Department of Fish and Wildlife: Developed a species distribution model for mountain yellow-legged frogs using Maxent, for inclusion in a status review of this taxon (2010-2011).

INVITED SEMINARS AND SYMPOSIA (last 10 years)

- '2019' *Natural recovery of endangered frogs in the presence of Bd as a guide for active conservation measures*. Symposium - Mitigating single pathogen and co-infections that threaten amphibian biodiversity. Zoological Society of London, London, UK.
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TEACHING EXPERIENCE

Lecturer: Taught two months of UCSB undergraduate course, *Ethology and Behavioral Ecology* (1991).

Guest Lecturer: Provided 1-2 hour lectures in undergraduate and high school courses:

- UCSB *Introduction to Environmental Studies*: 2014, 2016
- UCSB *Ecology and Management of California's Wildlands*: 2005, 2006, 2008, 2010, 2011
- University of Redlands *Environmental Chemistry Field Experience*: 2013

- Bay School of San Francisco *Water in the West*: 2019, 2022

GRADUATE STUDENT THESIS COMMITTEES

- I have served on the Ph.D. and Master's committees of graduate students from UCSB (1), UC Davis (3), UC Riverside (1), and CSU San Francisco (2).

PUBLICATIONS (peer-reviewed)

1. Knapp, R. A., M. B. Joseph, T. C. Smith, E. E. Hegeman, V. T. Vredenburg, J. E. Erdman Jr, D. M. Boiano, A. J. Jani, and C. J. Briggs. 2022. Effectiveness of antifungal treatments during chytridiomycosis epizootics in populations of an endangered frog. PeerJ 10:e12712.
2. Smith, T. C., R. A. Knapp, J. Imperato, K. Miller, and D. Rose. 2022. *Rana sierrae* (Sierra Nevada Yellow-legged Frog). Behavior and Diet. Herpetological Review 53:478–479.
3. Wilber, M. Q., R. A. Knapp, T. C. Smith, and C. J. Briggs. 2022. Host density has limited effects on pathogen invasion, disease-induced declines and within-host infection dynamics across a landscape of disease. Journal of Animal Ecology 91:2451–2464.
4. Ellison, S., R. Knapp, and V. Vredenburg. 2021. Longitudinal patterns in the skin microbiome of wild, individually marked frogs from the Sierra Nevada, California. ISME Communications 1:45.
5. Jani, A. J., J. Bushell, C. G. Arisdakessian, M. Belcaid, D. M. Boiano, C. Brown, and R. A. Knapp. 2021. The amphibian microbiome exhibits poor resilience following pathogen-induced disturbance. The ISME Journal 15:1628–1640.
6. Joseph, M. B., and R. A. Knapp. 2021. Using visual encounter data to improve capture–recapture abundance estimates. Ecosphere 12:e03370.
7. Rothstein, A. P., A. Q. Byrne, R. A. Knapp, C. J. Briggs, J. Voyles, C. L. Richards-Zawacki, and E. B. Rosenblum. 2021. Divergent regional evolutionary histories of a devastating global amphibian pathogen. Proceedings of the Royal Society B: Biological Sciences 288:20210782.
8. Tiberti, R., T. Buchaca, D. Boiano, R. A. Knapp, Q. Pou Rovira, G. Tavecchia, M. Ventura, and S. Tenan. 2021. Alien fish eradication from high mountain lakes by multiple removal methods: Estimating residual abundance and eradication probability in open populations. Journal of Applied Ecology 58:1055–1068.
9. Rothstein, A. P., R. A. Knapp, G. S. Bradburd, D. M. Boiano, C. J. Briggs, and E. B. Rosenblum. 2020. Stepping into the past to conserve the future: Archived skin swabs from extant and extirpated populations inform genetic management of an endangered amphibian. Molecular Ecology 29:2598–2611.
10. Byrne, A. Q., V. T. Vredenburg, A. Martel, F. Pasmans, R. C. Bell, D. C. Blackburn, M. C. Bletz, J. Bosch, C. J. Briggs, R. M. Brown, A. Catenazzi, M. Familiar López, R. Figueroa-Valenzuela, S. L. Ghose, J. R. Jaeger, A. J. Jani, M. Jirku, R. A. Knapp, A. Muñoz, D. M. Portik, C. L. Richards-Zawacki, H. Rockney, S. M. Rovito, T. Stark, H. Sulaeman, N. T. Tao, J. Voyles, A. W. Waddle, Z. Yuan, and E. B. Rosenblum. 2019. Cryptic diversity of a widespread global pathogen reveals expanded threats to amphibian conservation. Proceedings of the National Academy of Sciences 116:20382–20387.
11. Ellison, S., R. A. Knapp, W. Sparagon, A. Swei, and V. T. Vredenburg. 2019. Reduced skin bacterial diversity correlates with increased pathogen infection intensity in an endangered amphibian host. Molecular Ecology 28:127–140.
12. Joseph, M. B., and R. A. Knapp. 2018. Disease and climate effects on individuals drive post-reintroduction population dynamics of an endangered amphibian. Ecosphere 9:e02499.

13. Jani, A. J., R. A. Knapp, and C. J. Briggs. 2017. Epidemic and endemic pathogen dynamics correspond to distinct host population microbiomes at a landscape scale. Proceedings of the Royal Society B: Biological Sciences 284:20170944.
14. Poorten, T. J., R. A. Knapp, and E. B. Rosenblum. 2017. Population genetic structure of the endangered Sierra Nevada yellow-legged frog (*Rana sierrae*) in Yosemite National Park based on multi-locus nuclear data from swab samples. Conservation Genetics 18:731–744.
15. Smith, T. C., A. M. Picco, and R. Knapp. 2017. Ranaviruses infect mountain yellow-legged frogs (*Rana sierrae*) threatened by *Batrachochytrium dendrobatidis*. Herpetological Conservation and Biology 12:149–159.
16. Wilber, M. Q., R. A. Knapp, M. Toothman, and C. J. Briggs. 2017. Resistance, tolerance and environmental transmission dynamics determine host extinction risk in a load-dependent amphibian disease. Ecology Letters 20:1169–1181.
17. Knapp, R. A., G. M. Fellers, P. M. Kleeman, D. A. W. Miller, V. T. Vredenburg, E. B. Rosenblum, and C. J. Briggs. 2016. Large-scale recovery of an endangered amphibian despite ongoing exposure to multiple stressors. Proceedings of the National Academy of Sciences USA 113:11889–11894.
18. Piovia-Scott, J., S. Sadro, R. A. Knapp, J. Sickman, K. L. Pope, and S. Chandra. 2016. Variation in reciprocal subsidies between lakes and land: Perspectives from the mountains of California. Canadian Journal of Fisheries and Aquatic Sciences 73:1691–1701.
19. Smith, T. C., R. A. Knapp, and C. J. Briggs. 2016. Declines and extinctions of mountain yellow-legged frogs have small effects on benthic macroinvertebrate communities. Ecosphere 7:e01327.
20. Matchett, J. R., P. B. Stark, S. M. Ostoja, R. A. Knapp, H. C. McKenny, M. L. Brooks, W. T. Langford, L. N. Joppa, and E. L. Berlow. 2015. Detecting the influence of rare stressors on rare species in Yosemite National Park using a novel stratified permutation test. Scientific Reports 5:10702.
21. Zhou, H., T. Hanson, and R. Knapp. 2015. Marginal Bayesian nonparametric model for time to disease arrival of threatened amphibian populations. Biometrics 71:1101–1110.
22. Berlow, E. L., R. A. Knapp, S. M. Ostoja, R. J. Williams, H. McKenny, J. R. Matchett, Q. Guo, G. M. Fellers, P. Kleeman, M. L. Brooks, and L. Joppa. 2013. A network extension of species occupancy models in a patchy environment applied to the Yosemite toad (*Anaxyrus canorus*). PLoS ONE 8:e72200.
23. Bradford, D. F., K. A. Stanley, N. G. Tallent, D. W. Sparling, M. S. Nash, R. A. Knapp, L. L. McConnell, and S. L. Massey Simonich. 2013. Temporal and spatial variation of atmospherically deposited organic contaminants at high elevation in Yosemite National Park, California, USA. Environmental Toxicology and Chemistry 32:517–525.
24. Deiner, K., R. A. Knapp, D. M. Boiano, and B. May. 2013. Increased accuracy of species lists developed for alpine lakes using morphology and cytochrome oxidase I for identification of specimens. Molecular Ecology Resources 13:820–831.
25. Garwood, J. M., R. A. Knapp, K. L. Pope, R. L. Grasso, M. L. Magnuson, and J. R. Maurer. 2013. Use of historically fishless high-mountain lakes and streams by nearctic river otters (*Lontra canadensis*). Northwestern Naturalist 94:51–66.
26. Miner, B. E., R. A. Knapp, J. K. Colbourne, and M. E. Pfrender. 2013. Evolutionary history of alpine and subalpine *Daphnia* in western North America. Freshwater Biology 58:1512–1522.
27. Bradford, D. F., R. A. Knapp, D. W. Sparling, M. S. Nash, K. A. Stanley, N. G. Tallent-Halsell, L. L. McConnell, and S. M. Simonich. 2011. Pesticide distributions and population declines of California, USA, alpine frogs, *Rana muscosa* and *Rana sierrae*. Environmental Toxicology

and Chemistry 30:682–691.
28. Knapp, R. A., C. J. Briggs, T. C. Smith, and J. R. Maurer. 2011. Nowhere to hide: Impact of a temperature-sensitive amphibian pathogen along an elevation gradient in the temperate zone. Ecosphere 2:art93.
29. Briggs, C. J., R. A. Knapp, and V. T. Vredenburg. 2010. Enzootic and epizootic dynamics of the chytrid fungal pathogen of amphibians. Proceedings of the National Academy of Sciences, USA 107:9695–9700.
30. Epanchin, P. N., R. A. Knapp, and S. P. Lawler. 2010. Nonnative trout impact an alpine-nesting bird by altering aquatic-insect subsidies. Ecology 91:2406–2415.
31. Latta, L. C., D. L. Fisk, R. A. Knapp, and M. E. Pfrender. 2010. Genetic resilience of *Daphnia* populations following experimental removal of introduced fish. Conservation Genetics 11:1737–1745.
32. Vredenburg, V. T., R. A. Knapp, T. S. Tunstall, and C. J. Briggs. 2010. Dynamics of an emerging disease drive large-scale amphibian population extinctions. Proceedings of the National Academy of Sciences, USA 107:9689–9694.
33. Knapp, R. A., and O. Sarnelle. 2008. Recovery after local extinction: Factors affecting re-establishment of alpine lake zooplankton. Ecological Applications 18:1850–1859.
34. Kramer, A. M., O. Sarnelle, and R. A. Knapp. 2008. Allee effect limits colonization success of sexually reproducing zooplankton. Ecology 89:2760–2769.
35. Davidson, C., and R. A. Knapp. 2007. Multiple stressors and amphibian declines: Dual impacts of pesticides and fish on yellow-legged frogs. Ecological Applications 17:587–597.
36. Fisk, D. L., L. C. Latta, R. A. Knapp, and M. E. Pfrender. 2007. Rapid evolution in response to introduced predators I: Rates and patterns of morphological and life-history trait divergence. BMC Evolutionary Biology 7:22.
37. Knapp, R. A., D. M. Boiano, and V. T. Vredenburg. 2007. Removal of nonnative fish results in population expansion of a declining amphibian (mountain yellow-legged frog, *Rana muscosa*). Biological Conservation 135:11–20.
38. Latta, L. C., J. W. Bakelar, R. A. Knapp, and M. E. Pfrender. 2007. Rapid evolution in response to introduced predators II: The contribution of adaptive plasticity. BMC Evolutionary Biology 7:21.
39. Morgan, J. A. T., V. T. Vredenburg, L. J. Rachowicz, R. A. Knapp, M. J. Stice, T. Tunstall, R. E. Bingham, J. M. Parker, J. E. Longcore, C. Moritz, C. J. Briggs, and J. W. Taylor. 2007. Population genetics of the frog-killing fungus *Batrachochytrium dendrobatidis*. Proceedings of the National Academy of Sciences, USA 104:13845–13850.
40. Vredenburg, V. T., R. Bingham, R. Knapp, J. A. T. Morgan, C. Moritz, and D. Wake. 2007. Concordant molecular and phenotypic data delineate new taxonomy and conservation priorities for the endangered mountain yellow-legged frog. Journal of Zoology 271:361–374.
41. Dondale, C. D. 2006. Two new species of wolf spiders in the *Pardosa modica* group (Araneae, Lycosidae) from North America. Journal of Arachnology 34:506–510.
42. Knapp, R. A., and J. A. T. Morgan. 2006. Tadpole mouthpart depigmentation as an accurate indicator of chytridiomycosis, an emerging disease of amphibians. Copeia 2006:188–197.
43. Rachowicz, L. J., R. A. Knapp, J. A. T. Morgan, M. J. Stice, V. T. Vredenburg, J. M. Parker, and C. J. Briggs. 2006. Emerging infectious disease as a proximate cause of amphibian mass mortality. Ecology 87:1671–1683.
44. Adams, M. J., B. R. Hossack, R. A. Knapp, P. S. Corn, S. A. Diamond, P. C. Trenham, and D. B. Fagre. 2005. Distribution patterns of lentic-breeding amphibians in relation to ultraviolet radiation exposure in western North America. Ecosystems 8:488–500.

45. Briggs, C. J., V. T. Vredenburg, R. A. Knapp, and L. J. Rachowicz. 2005. Investigating the population-level effects of chytridiomycosis: An emerging infectious disease of amphibians. Ecology 86:3149–3159.
46. Brooks, P. D., C. M. O'Reilly, S. A. Diamond, D. H. Campbell, R. Knapp, D. Bradford, P. S. Corn, B. Hossack, and K. Tonnessen. 2005. Spatial and temporal variability in the amount and source of dissolved organic carbon: Implications for ultraviolet exposure in amphibian habitats. Ecosystems 8:478–487.
47. Brose, U., L. Cushing, E. L. Berlow, T. Jonsson, C. Banasek-Richter, L.-F. Bersier, J. L. Blanchard, T. Brey, S. R. Carpenter, M.-F. C. Blandenier, J. E. Cohen, H. A. Dawah, T. Dell, F. Edwards, S. Harper-Smith, U. Jacob, R. A. Knapp, M. E. Ledger, J. Memmott, K. Mintenbeck, J. K. Pinnegar, B. C. Rall, T. Rayner, L. Ruess, W. Ulrich, P. Warren, R. J. Williams, G. Woodward, P. Yodzis, and N. D. Martinez. 2005. Body sizes of consumers and their resources. Ecology 86:2545.
48. Diamond, S. A., P. C. Trenham, M. J. Adams, B. R. Hossack, R. A. Knapp, S. L. Stark, D. Bradford, P. S. Corn, K. Czarnowski, P. D. Brooks, D. Fagre, B. Breen, N. E. Detenbeck, and K. Tonnessen. 2005. Estimated ultraviolet radiation doses in wetlands in six national parks. Ecosystems 8:462–477.
49. Harper-Smith, S., E. L. Berlow, R. A. Knapp, R. J. Williams, and N. D. Martinez. 2005. Communicating ecology through food webs: Visualizing and quantifying the effects of stocking alpine lakes with trout. Pages 407–423 *in* P. C. de Ruiter, V. Wolters, and J. C. Moore, editors. Dynamic food webs - multispeces assemblages, ecosystem development and environmental change. Academic Press, Burlington, Massachusetts.
50. Knapp, R. A. 2005. Effects of nonnative fish and habitat characteristics on lentic herpetofauna in Yosemite National Park, USA. Biological Conservation 121:265–279.
51. Knapp, R. A., C. P. Hawkins, J. Ladau, and J. G. McClory. 2005. Fauna of Yosemite National Park lakes has low resistance but high resilience to fish introductions. Ecological Applications 15:835–847.
52. Sarnelle, O., and R. A. Knapp. 2005. Nutrient recycling by fish versus zooplankton grazing as drivers of the trophic cascade in alpine lakes. Limnology and Oceanography 50:2032–2042.
53. Armstrong, T. W., and R. A. Knapp. 2004. Response by trout populations in alpine lakes to an experimental halt to stocking. Canadian Journal of Fisheries and Aquatic Sciences 61:2025–2037.
54. Sarnelle, O., and R. A. Knapp. 2004. Zooplankton recovery after fish removal: Limitations of the egg bank. Limnology and Oceanography 49:1382–1392.
55. Knapp, R. A., K. R. Matthews, H. K. Preisler, and R. Jellison. 2003. Developing probabilistic models to predict amphibian site occupancy in a patchy landscape. Ecological Applications 13:1069–1082.
56. Matthews, K. R., R. A. Knapp, and K. L. Pope. 2002. Garter snake distributions in high-elevation aquatic ecosystems: Is there a link with declining amphibian populations and nonnative trout introductions? Journal of Herpetology 36:16–22.
57. Knapp, R. A., P. S. Corn, and D. E. Schindler. 2001a. The introduction of nonnative fish into wilderness lakes: Good intentions, conflicting mandates, and unintended consequences. Ecosystems 4:275–278.
58. Knapp, R. A., J. A. Garton, and O. Sarnelle. 2001b. The use of egg shells to infer the historical presence of copepods in alpine lakes. Journal of Paleolimnology 25:539–543.
59. Knapp, R. A., K. R. Matthews, and O. Sarnelle. 2001c. Resistance and resilience of alpine lake fauna to fish introductions. Ecological Monographs 71:401–421.

60. Matthews, K. R., K. L. Pope, H. K. Preisler, and R. A. Knapp. 2001. Effects of nonnative trout on Pacific treefrogs (*Hyla regilla*) in the Sierra Nevada. Copeia 101:1130–1137.
61. Schindler, D. E., R. A. Knapp, and P. R. Leavitt. 2001. Alteration of nutrient cycles and algal production resulting from fish introductions into mountain lakes. Ecosystems 4:308–321.
62. Knapp, R. A., and K. R. Matthews. 2000. Non-native fish introductions and the decline of the mountain yellow-legged frog from within protected areas. Conservation Biology 14:428–438.
63. Knapp, R. A., and H. K. Preisler. 1999. Is it possible to predict habitat use by spawning salmonids? A test using California golden trout (*Oncorhynchus mykiss aguabonita*). Canadian Journal of Fisheries and Aquatic Sciences 56:1576–1584.
64. Matthews, K. R., and R. A. Knapp. 1999. A study of high mountain lake fish stocking effects on the U.S. Sierra Nevada wilderness. International Journal of Wilderness 5:24–26.
65. Knapp, R. A., and K. R. Matthews. 1998. Eradication of nonnative fish by gill netting from a small mountain lake in California. Restoration Ecology 6:207–213.
66. Knapp, R. A., V. T. Vredenburg, and K. R. Matthews. 1998. Effects of stream channel morphology on golden trout spawning habitat and recruitment. Ecological Applications 8:1104–1117.
67. Knapp, R. A., and K. R. Matthews. 1996. Livestock grazing, golden trout, and streams in the Golden Trout Wilderness, California: Impacts and management implications. North American Journal of Fisheries Management 16:805–820.
68. Knapp, R. A., and V. T. Vredenburg. 1996b. A field comparison of the substrate composition of California golden trout redds sampled with two devices. North American Journal of Fisheries Management 16:674–681.
69. Knapp, R. A., and V. T. Vredenburg. 1996a. Spawning by California golden trout: Characteristics of spawning fish, seasonal and daily timing, redd characteristics, and microhabitat preferences. Transactions of the American Fisheries Society 125:519–531.
70. Knapp, R. A. 1995. Influence of energy reserves on the expression of a secondary sexual trait in male bicolor damselfish, *Stegastes partitus*. Bulletin of Marine Science 57:672–681.
71. Knapp, R. A., P. C. Sikkel, and V. T. Vredenburg. 1995. Age of clutches in nests and the within-nest spawning-site preferences of three damselfish species (Pomacentridae). Copeia 1995:78–88.
72. Knapp, R. A. 1993. The influence of egg survivorship on the subsequent nest fidelity of female bicolour damselfish, *Stegastes partitus*. Animal Behaviour 46:111–121.
73. Knapp, R. A., and J. T. Kovach. 1991. Courtship as an honest indicator of male parental quality in the bicolor damselfish, *Stegastes partitus*. Behavioral Ecology 2:295–300.
74. Knapp, R. A., and R. R. Warner. 1991. Male parental care and female choice in the bicolor damselfish, *Stegastes partitus*: Bigger is not always better. Animal Behaviour 41:747–756.
75. Knapp, R. A., and T. L. Dudley. 1990. Growth and longevity of golden trout, *Oncorhynchus aguabonita*, in their native streams. California Fish and Game 76:161–173.
76. Knapp, R. A., and R. C. Sargent. 1989. Egg-mimicry as a mating strategy in the fantail darter, *Etheostoma flabellare*: Females prefer males with eggs. Behavioral Ecology and Sociobiology 25:321–326.
77. Wilzbach, M. A., K. W. Cummins, and R. A. Knapp. 1988. Toward a functional classification of stream invertebrate drift. Verhandlung Internationale Vereinigung Limnologie 23:1244–1254.

To do

- Add the following sections:

– Graduate Student Thesis Committees

– Extramural Grants

– Publications: Peer-reviewed, Proceedings/Reports

– Invited Seminars & Symposia

– Presented Papers