

MATTHIEU LERAY

Post-doctoral researcher

Smithsonian Tropical Research Institute, Smithsonian Institution

Panama City, Balboa, Ancon, Republic of Panama

♦ Email: leray.upmc@gmail.com ♦ Phone: +507 64950970

EDUCATION

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| PhD | 2012 | Université Pierre et Marie Curie, Paris, France
Functional ecology, genetics, marine biodiversity
Advisor: Dr. Suzanne Mills |
| MS | 2008 | Université Pierre et Marie Curie, Paris, France
Oceanography and evolutionary biology
Advisor: Prof. Serge Planes |
| BS | 2005 | Université de Rennes I, Rennes, France
General biology |

PROFESSIONAL APPOINTMENTS

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| 2018- | Post-doctoral researcher, Gordon & Betty Moore found., Smithsonian Tropical Research Institute, Republic of Panama. Adv.: Dr. William Wcislo
<i>Evolution and adaptation of microbial symbionts using sister species separated by the Isthmus of Panama</i> |
| 2016-2017 | Post-doctoral researcher, Smithsonian Tropical Research Institute, Republic of Panama. Adv.: Prof. Nancy Knowlton
<i>The scaling of diversity in tropical coastal marine ecosystems</i> |
| 2013-2015 | Post-doctoral researcher, MarineGeo, Smithsonian National Museum of Natural History, DC, USA. Adv.: Prof. Nancy Knowlton
<i>The dynamics of competition during succession across a latitudinal gradient</i> |

FELLOWSHIPS

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| 2018-2020 | Gordon & Betty Moore foundation & STRI, 165,000 USD |
| 2016-2017 | Smithsonian Tropical RI post-doctoral fellowship, 110,000 USD |
| 2013-2015 | Smithsonian MarineGeo post-doctoral fellowship, 98,000 USD |
| 2009 | Smithsonian NMNH pre-doctoral fellowship, 10,000 USD |
| 2008-2012 | PhD fellowship, Ministry of education and research of France, 60,000 EUR |

GRANTS

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| 2019-2022 | NSF* Systematic and Biodiversity Science, “ <i>PurSUIT: Diversity and endemism across a steep biogeographic cline: marine invertebrates of Oman</i> ”. 825,523 USD. Listed as senior personnel, PI: Paulay G |
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- 2017-present Smithsonian Global Genome Initiative, “*Root epibiont diversity in tropical mangrove forest of Bocas del Toro*”. 9,597 USD. **Leray M** and Paulay G
- 2017-present STRI Rubinoff's Big Bet award, “*Exploring metabolic adaptations of trans-isthmian reef-associated microbes*”. 15,000 USD. **Leray M**, McMillan WO, Scott J, Altieri HA and Knowlton N.
- 2017-present Smithsonian Global Genome Initiative, “*Marine invertebrate diversity in the Fort Pierce inlet and beyond*”. 28,950 USD. Boyle MJ, Paul V, Paulay G, **Leray M**, Janiak D.
- 2017-present Environment and Conservation Fund Hong Kong, “*MarineGEO-Hong Kong, Towards an understanding of marine biodiversity and ecosystem function*”. 412,000 USD. Listed as a collaborator. PI: Baker DM
- 2016-present Ministry of foreign affairs Government of Chile, “*Disentangling the complexity of Antarctic marine benthic food webs*”. 57,000 USD. Sepúlveda RD, Saenz Agudelo P, Guillemin ML, **Leray M**, McMahon K, Beckerman A
- 2016-2017 Smithsonian Global Genome Initiative, “*Capturing the genomic diversity of the San Juan Islands' marine ecosystems*”. 10,000 USD. **Leray M** and Paulay G.
- 2016-2017 Smithsonian Scholarly Studies grant, “*The scaling of diversity in tropical marine ecosystems*”. 36,400 USD. **Leray M**, Altieri AH, Knowlton N
- 2016-2017 Smithsonian Global Genome Initiative, “*Drivers of diversity on coral reefs of Bocas del Toro*”. 9,905 USD. **Leray M**, Knowlton N, Paulay G.
- 2015-2016 Consortium for the Barcode of Life, “*Barcoding cryptic microscopic diversity across a latitudinal gradient*”. 18,000 USD. **Leray M**, Duffy JE, Knowlton N.
- 2013 NSF Partnerships for International Research and Education (PIRE), “*Assembly of marine diversity along geographic and anthropogenic stress gradients*”. 5,129,134 USD. Co-writer of the proposal, PIs: Rohwer F, Barber PH.
- * note that STRI postdoctoral researchers cannot be listed as PI or co-PI on NSF applications

PUBLICATIONS

* undergraduate or graduate student author

** shared first authorship

Peer reviewed

- 30 **Leray M**, Knowlton N, Ho S, Nguyen BN, Machida R. 2019. GenBank is a reliable resource for 21st century biodiversity research. *Proceedings of the National Academy of Sciences of the United States of America*. 116, 22651-22656
- 29 Wilkins LGE**, **Leray M****, Yuen B, Peixoto R, Pereira TJ, Bik HM, Coil DA, Duffy JE, Herre EA, Lessios H, Lucey N, Mejia LC, O'dea A, Rasher DB, Sharp K, Sogin EM, Thacker RW, Vega Thurber R, Wcislo WT, Wilbanks EG, Eisen JA. Host-associated microbiomes drive structure and function of marine ecosystems. *PLoS Biology* 17, e3000533
- 28 VonWormhoudt A, Adjeroud M, Rouze H, **Leray M**. 2019. Recent and old duplications in crustaceans “Internal Transcribed Spacer 1”: structural and phylogenetic implications. *Molecular Biology Reports* 46, 5185-5195

- 27 **Leray M**, Alldredge AL, Yang JY, Meyer CP, Holbrook SJ, Schmitt RJ, Knowlton N, Brooks AJ. 2019. Dietary partitioning promotes the coexistence of planktivorous species on coral reefs. *Molecular ecology* 28, 2694-2710
- 26 Kandler NM*, Wooster MK, **Leray M**, Knowlton N, de Voogd NJ, Paulay G, Berumen ML. 2019. Hyperdiverse macrofauna communities associated with a common sponge, *Stylissa carteri*, shift across ecological gradients in the Central Red Sea. *Diversity* 11, 18
- 25 Galtier d'Auriac I, Quinn RA, Maughan H, Nothias LF, Little M, Kapon CA, Cobian A, Reyes BT, Green K, Quistad SD, **Leray M**, Smith JE, Dorrestein PC, Rohwer F, Deheyn DD, Hartmann AC. 2018. Before platelets: the production of platelet-activating factor during growth and stress in a basal marine organism. *Proceedings of the Royal Society B: Biological Sciences* 285, 20181307
- 24 Pearman JK, **Leray M**, Villalobos R*, Machida R, Berumen M, Knowlton N, Carvalho S. 2018. Cross-shelf investigation of coral reef cryptic benthic organisms reveals diversity patterns of the hidden majority. *Scientific Reports* 8, 8090
- 23 Pachelle PPG, **Leray M**, Anker AA, Lasley R. 2018. Five new records of marine shrimps (Decapoda: Caridea, Stenopodidea) from the Caribbean coast of Panama. *Zootaxa*. 4438,128-136
- 22 **Leray M**, Ho S-L, Lin J, Machida R. 2018. MIDORI server: a webserver for taxonomic assignment of unknown metazoan mitochondrial-encoded sequences using a curated database. *Bioinformatics* bty454
- 21 Ransome E, Geller JB, Timmers M, **Leray M**, Mahardini A, Sembiring A, Collins AG, Meyer CP. 2017. The importance of standardization for biodiversity comparisons, A case study using autonomous reef monitoring structures (ARMS) and metabarcoding to measure cryptic diversity on Mo'orea coral reefs, French Polynesia. *PLoS One* 12,e0175066
- 20 Rouzé H, **Leray M**, Magalon H, Penin L, Gélín P, Knowlton N, Fauvelot C. 2017. Molecular characterization reveals the complexity of previously overlooked coral-exosymbiont interactions and the implications for coral-guild ecology. *Scientific Report* 7,44923
- 19 **Leray M**, Knowlton N. 2017. Random sampling causes the low reproducibility of rare eukaryotic OTUs in Illumina COI metabarcoding. *PeerJ* 5,e3006
- 18 Machida RJ, **Leray M**, Ho S-L, Knowlton N. 2017. Metazoan mitochondrial gene sequence reference datasets for taxonomic assignment of environmental samples. *Scientific Data* 4,170027
- 17 **Leray M**, Knowlton N. 2016. Censusing marine eukaryotic diversity in the twenty-first century. *Philosophical Transactions of the Royal Society B* 371,20150331
- 16 Al-Rshaidat MMD, Snider A*, Rosebraugh S*, Devine AM*, Devine TD*, Plaisance L, Knowlton N, **Leray M**. 2016. Deep COI sequencing of standardized benthic samples unveils overlooked diversity of Jordanian coral reefs in the northern Red Sea. *Genome* 59,724-737
15. **Leray M**, Knowlton N. 2016. Visualizing patterns of marine eukaryotic diversity from metabarcoding data using QIIME. In, Bourlat S.J. (eds) *Methods in Molecular Biology, Marine Genomics Methods and Protocols*. Springer Protocols, pp 219-235
- 14 Bourlat SJ, Haenel Q, Finnman J, **Leray M**. 2016. Preparation of amplicon libraries for metabarcoding of marine eukaryotes using Illumina MiSeq, The dual-PCR method. In, Bourlat S.J. (eds) *Methods in Molecular Biology, Marine Genomics Methods and Protocols*. Springer Protocols, pp 197-207

- 13 **Leray M**, Haenel Q, Bourlat SJ. 2016. Preparation of amplicon libraries for metabarcoding of marine eukaryotes using Illumina MiSeq, The adapter ligation method. In, Bourlat S.J. (eds) *Methods in Molecular Biology, Marine Genomics Methods and Protocols*. Springer Protocols, pp 209-218
 - 12 **Leray M**, Meyer CP, Mills SC. 2015. Metabarcoding dietary analysis of coral dwelling predatory fish demonstrates the minor contribution of coral mutualists to their highly partitioned, generalist diet. *PeerJ* 3,e1047
 - 11 Knowlton N, **Leray M**. 2015. Exploring coral reefs using the tools of molecular genetics. In, Birkeland C. (eds) *Coral Reefs in the Anthropocene*. Springer Science+Business Media, Dordrecht, pp 117-132
 - 10 **Leray M**, Knowlton N. 2015. DNA barcoding and metabarcoding of standardized samples reveal patterns of marine benthic diversity. *Proceedings of the National Academy of Sciences of the United States of America*. 112,2076-2081
- Featured by the Washington post
- 9 Stier AC**, **Leray M****. 2014. Predators alter community organization of coral reef cryptofauna and reduce abundance of coral mutualists. *Coral Reefs* 33,181-191
 - 8 **Leray M**, Yang JY, Meyer CP, Mills SC, Agudelo N*, Ranwez V, Boehm JT, Machida RJ. 2013. A new versatile primer set targeting a short fragment of the mitochondrial COI region for metabarcoding metazoan diversity, application for characterizing coral reef fish gut contents. *Frontiers in Zoology* 10,34
- Top five most accessed (>20,000) and cited (99th percentile) of the journal
- 7 **Leray M**, Agudelo N*, Mills SC, Meyer CP. 2013. Effectiveness of annealing blocking primers versus restriction enzymes for characterization of generalist diets, unexpected prey revealed in the gut contents of two coral reef fish species. *PLoS One* 8,e58076
 - 6 **Leray M**, Boehm JT, Mills SC, Meyer CP. 2012. Moorea BIOCODE barcode library as a tool for understanding predator-prey interactions, insights into the diet of common predatory coral reef fishes. *Coral Reefs* 31,383-388
 - 5 **Leray M**, Beraud M*, Anker A, Chancerelle Y, Mills S. 2012. Acanthaster planci outbreak, decline in coral health, coral size structure modification and consequences for obligate decapod assemblages. *PLoS One* 7,e35456
 - 4 Stier AC, Gil MA, McKeon CS, Lemer S, **Leray M**, Mills SC, Osenberg CW. 2012. Housekeeping mutualisms, do more symbionts facilitate host performance? *PLoS One* 7,e32079
 - 3 **Leray M**, Beldade R, Holbrook SJ, Schmitt RJ, Planes S, Bernardi G. 2010. Allopatric divergence and speciation in coral reef fish, the three-spot Dascyllus, *Dascyllus trimaculatus*, species complex. *Evolution* 64,1218-1230
 - 2 Van Herwerden L, Howard Choat J, Newman SJ, **Leray M**, Hillersø G. 2009. Complex patterns of population structure and recruitment of *Plectropomus leopardus* (Pisces, Epinephelidae) in the Indo-West Pacific, Implications for fisheries management. *Marine Biology* 156,1595-1607
 - 1 **Leray M**, Beldade R, Holbrook SJ, Schmitt RJ, Planes S, Bernardi G. 2009. Isolation and characterization of 13 polymorphic nuclear microsatellite primers for the widespread Indo-Pacific three-spot damselfish, *Dascyllus trimaculatus*, and closely related *D. auripinnis*. *Molecular Ecology Resources* 9,213-215

Other publications (non peer reviewed)

- 3 Paulay G, Lasley R, Michonneau F, Pineda-Enriquez T, Anker A, Hiller A, Schulze A, Valdes A, Windsor A, Winston A., Watson C., Eernisse D., Maslakova S., Felder D.,

- Lee H.G., Slapcinsky J., Winston J., Thomas J.D., Harris L., Carrera-Parra L.F., Demaintenon M., LitvaiIs M., Bruce N., O'Donnell J., Nguyen B., **Leray M.** 2017. Cryptobenthic invertebrates of Bocas del Toro, Panama - Field guide v.1.0. *Figshare*. doi.org/10.6084/m9.figshare.5183722.v1
- 2 Al-Rshaidat MMD, **Leray M.**, Knowlton N. 2016. Exploring the cryptic diversity of Jordanian coral reefs. *Barcode Bulletin* 7,11-12
- 1 **Leray M.**, Knowlton N. 2015. Metabarcoding the ocean. *Barcode Bulletin* 6,2-3

CONFERENCE PRESENTATIONS

- 2016 13th International Coral Reef Symposium, Honolulu, Hawai'i, USA
- Unraveling inshore-offshore macrobenthic diversity patterns in Red Sea coral reefs (Saudi Arabia) using DNA barcoding. Villalobos R, **Leray M.**, Pearman J, Carvalho S, Anlauf H, Wooster M, Bouwmeester J, Kattan A, Khalil M, Jones B, Knowlton N, Berumen M
 - Sponges as a microhabitat for macrofauna and microbes across ecological gradients in the central Red Sea. Kandler NM, Wooster MK, **Leray M.**, Voolstra CR, Knowlton N, De Voogd NJ, Paulay G, Berumen ML
 - Biodiversity estimation from individual samples and metabarcoded community samples. Michonneau F, **Leray M.**, Lasley RR, Rotjan R, Paulay G, Knowlton N
- 2015 6th International Barcode of Life Conference, Guelph, Ontario, Canada
- Censusing marine life in the 21st century. Knowlton N, **Leray M.**
- 2012 12th International Coral Reef Symposium, Cairns, Queensland, Australia.
- 1 Using metabarcoding analysis to understand predator prey interactions on coral reefs. **Leray M.**, Mills SC and Meyer CP
 - 2 Using next generation sequencing to understand coral reef diversity. Knowlton N, Meyer CP, **Leray M.**, Machida R, Caley J, Brainard R, Plaisance L
- 2010 Evolution Meeting (Society for the Study of Evolution), Portland, Oregon, USA
- 2 Decapods living with potential fish predators, Examining species coexistence using gut content DNA analysis. **Leray M.**, Mills SC, Meyer CP
- 2009 11th Pacific Science Inter-Congress, Tahiti, French Polynesia
- 3 Geographical mode of speciation in a coral reef fish complex. **Leray M.**, Beldade R, Holbrook SJ, Schmitt RJ, Planes S, Bernardi G
 - 4 Coral reef degradation – the future of crustaceans. **Leray M.**, Mills SC, Bernardi G
- 2008 11th International Coral Reef Symposium, Fort Lauderdale, Florida, USA.
- 3 Absence of geographic barrier across the Indo-Pacific province for coral reef fishes. Planes S, Fauvelot C, Messmer V, Swarup S, **Leray M.**, Tison JL
 - 4 Population structure of the three-spot damselfish, *Dasyllus trimaculatus*, across its distribution range. **Leray M.**, Beldade R, Planes S, Holbrook S, Schmitt R, Bernardi G

INVITED TALKS

- 2018 Universidad Austral de Chile, Valdivia, Chile (seminar)
- 2016 Whitney laboratory of Bioscience, St Augustine, FL, USA (seminar)

- Microbiome science symposium, STRI, Panama (talk)
- 2015 Univ. of La Reunion, Reunion Island, France (seminar)
 Dep. Ecology and Evolution, Univ. of Florida, Gainesville, FL, USA (seminar)
 Tupper talk, STRI, Panama (seminar)
- 2014 Lightning talk series, Smithsonian NMNH, Washington, DC, USA (talk)
 Lab. of Analytical Biology, Smithsonian NMNH, Washington, DC, USA (seminar)
 MOTE marine lab, Sarasota, FL, USA (seminar)
- 2013 King Abdullah University of Sc. and Tech., Thuwal, Saudi Arabia (seminar)
- 2012 Hawai'i Institute of Marine Biology, Univ. of Hawai'i, O'ahu, USA (seminar)
- 2011 Center of Island Research and Environmental Obs., French Polynesia (seminar)

TEACHING EXPERIENCE

Instructor

- 2013-2019 IGERT-NEO Tropical Biology field course, STRI, Bocas del Toro & Coiba National Park, Rep. of Panama. ~1 week each year.
- 2016 Methods in Biodiversity, Friday Harbor Labs, University of Washington, USA, Graduate-level summer course. 12 students. 5 weeks.
- 2012 Invertebrate Zoology field course, Indonesian Biodiversity Research Center, Bali, Indonesia. 25 students. 4 weeks.

Guest lectures

- 2018 Metabarcoding and bioinformatics. Universidad Austral de Chile, Valdivia, Chile.
- 2015 Bioinformatics for Metagenomics. Bioinformatics lecture series, Smithsonian NMNH, Washington, DC, USA.
- 2014 Marine Biodiversity. Natural History Research Experiences (NHRE) program, Smithsonian NMNH, Washington, DC, USA.
- 2013-2014 Marine Biodiversity. Youth Engagement Through Science (YES) program, Smithsonian NMNH, Washington, DC, USA.
- 2013 Invertebrate Zoology. Univ. of Aqaba, Aqaba, Jordan.
 Molecular Ecology and Marine Biodiversity. King Abdullah University of Sc. and Tech., Thuwal, Saudi Arabia.
- 2012 Indonesian Biodiversity Research Center, Bali, Indonesia

STUDENT ADVISING AND MENTORSHIP

Academic level and affiliation at the time of advising are indicated

* student co-author on peer reviewed publication(s)

Graduate students

- 2019 Jade Sourisse, MS stdt, Univ. Paris Sorbonne, Masters research advisor
- 2018-9 Friederike Clever, PhD stdt, Manchester Metrop. Univ., PhD mentor
- 2018 Abigail Cannon, PhD stdt, SCRIPPS, PhD mentor (1 chapter)
- 2017-9 Bryan Nguyen, PhD stdt, George Washington Univ., PhD mentor

- 2016 Nicole Knight, PhD stdt, McGill Univ, STRI NEO research internship advisor
 2015 Nora Kandler*, MS stdt, KAUST Univ, Masters research co-advisor
 Rodrigo Villalobos*, MS stdt, KAUST Univ, Masters research co-advisor
 Liz Scheimer, MS, graduated from Stanford Univ, SI NMNH internship
 2014 Laura Dufranc, MS, EPHE Paris Sorbonne, Masters research co-advisor
 2013 Mehreen Mughal, MS stdt, Georgetown Univ, SI NMNH summer intern
 2010 Maxime Beraud*, MS stdt, EPHE Paris Sorbonne, Masters thesis co-advisor

Undergraduate students

- 2019 Helio Quintero, BS, Univ of Panama, STRI & SENACYT short-term fellow
 2018-9 Edna Rodriguez, BS, Univ of Cundinamarca, STRI intern
 2017 Joan Antaneda, BS stdt, Univ of Panama, STRI & SENACYT short-term fellow
 Amanda Chiachi, BS, Univ of California Davis, STRI summer intern
 Elaine Shen, BS stdt, Rice Univ, Undergraduate senior thesis co-advisor
 Rosalyn Lam, BS, Univ of California Davis, STRI summer intern
 Daniella Heflin, BS stdt, George Washington Univ, STRI summer intern
 Giovanna Kupiec, BS stdt, George Washington Univ, STRI summer intern
 Collin McMillan, BS, Univ of Notre Dame, STRI summer intern
 Ryan Herold, BS, Long Island Univ/Watson foundation fellow, STRI summer intern
 2016 Lyle McMillan, BS stdt, Duke Univ, STRI summer intern
 Natasha Hinojosa, BS stdt, Univ North Carolina, STRI summer intern
 2014 Sydney Rosebraugh*, BS, Univ of Chicago, SI NMNH intern
 Allison Snider*, BS stdt, Central Michigan Univ, SI NMNH summer intern
 Tommy Devine*, BA, Ohio State Univ, SI NMNH intern.
Hired as project manager at SI NMNH following internship training. Supervisor: Dr. Carole Baldwin
 2013 Victoria Morgan, BA stdt, Cornell Univ, Undergraduate thesis co-advisor.
Awarded NSF graduate fellowship, currently PhD student at UC Davis. Supervisor: Prof. Rick Grosberg
 Amanda Devine*, BS, Dartmouth College, SI NMNH intern.
Hired as data manager at SI NMNH following internship training. Supervisor: Dr. Jonathan Coddington
 Samantha Clark, BS stdt, Univ of Virginia, SI NMNH summer intern
 2010 Natalia Agudelo*, BS stdt, Northeastern Univ, SI NMNH intern
Hired as lab. technician at SI NMNH following internship training. Supervisor: Lee Weigt

RESEARCH EXPEDITIONS

- 2017-9 Coordinator, Coiba National Park (10 days x 5), Republic of Panama
 Organizer: STRI. PIs: Matthieu Leray, Jarrod Scott, Owen McMillan
 2013 Invited researcher, Southern Line Island research cruise (4 weeks), Rep. of Kiribati.
 Organizer: SCRIPPS Inst. of Oceanography. PIs: Stuart Sandin, Forest Rohwer
 2012 Invited researcher, Marine BioBlitz (2 weeks), Madang, Papua New Guinea.
 Organizer: Paris Museum of Natural History. PI: Philippe Bouchet

WORKSHOPS

- 2014 MEGA workshop, MOTE Marine Laboratory, FL, USA. Methods in Ecological Genomics.

2009 - 2012 Summer workshops, Moorea, French Polynesia. Funded by the Partner University Funds to promote scientific collaboration and cultural exchange between French and American students

ADDITIONAL COMPETENCES AND CERTIFICATIONS

Languages English (fluent), Spanish (fluent), French (mother tongue)
Safety Certified in First aid, CPR and Oxygen administration
Scuba Diving 2 stars CMAS, Smithsonian Diver Certified
Boat driving European and Panamanian boat drivers licenses

PROFESSIONAL SERVICES

Scientific reviewer: Molecular Ecology, Methods in Ecology and Evolution, Nature Ecology and Evolution, PloS one, Coral reefs, Marine Ecology Progress Series, Molecular Ecology Resources, Ecology and Evolution, PeerJ.

Donor outreach: >10 presentations for donors or potential donors (i.e. CEO of Life Technology, CEO of Oxford Nanopore, groups of donors for the launch of the SI Capital Campaign, SI NMNH board members) of the Smithsonian Natural History Museum in Washington DC (2011-2015).

Professional affiliations (current only): International Society for Reef Studies, Society for Integrative and Comparative Biology, Society for the Study of Evolution, Ecological Society of America.

PUBLIC OUTREACH

2010-2018 Activities on “World Ocean Day”
○ Scientific advising and support for the design of public exhibits at the Smithsonian NMNH, Washington, DC:
○ Life in one cubic foot (opened March 2016)
○ “Reef unleashed” at the Q&rius science education center
2013-2016 “The Scientist Is In”. Regular interactions with the public at the Sant Ocean Hall of the Smithsonian NMNH, Washington, DC.
2012 Youth Engagement Through Science (YES) program, Smithsonian NMNH, Washington, DC. Presentations and activities with minority high school students from the Washington DC area.