*Bio 21* — *Science of the Extreme Life of the Sea*

Steve Palumbi — Tues 2:15 Bldg 60 R — TA: Will Ary
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| Course requirements | Lecture 1 at 2:15 PM<br>Lecture 2 at 4:00 PM | | Title | Topic |
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| | 6-Jan | Lecture 1 | The Epic Ocean | Battles, conflict and cooperation among the species that inhabit the seas |
| | | Lecture 2 | Life begins in the ocean | The origin of life on Earth began in the sea, and the greatest diversity still resides there. |
| Quiz | 13-Jan | Lecture 3 | Living fossils | The types of species that are successful for many 100s of millions of years |
| | | Lecture 4 | Mass extinctions and the history of life | The five cycles of diversity and collapse during the history of life:patterns and consequences. |
| | 20-Jan | Lecture 5 | The smallest | Microbes are so abundan that they have an outsized effect on the chemistry of the oceans and the atmosphere. |
| | | Lecture 6 | The microbial loop, arms races and kill the winner | Predator-prey interactions among microbes account for a surprising fraction of the world's ecological flux. |
| Q and Product 1 due | 27-Jan | Lecture 7 | The deepest: cold, starvation, pressure and light | How molecules work under pressure: biophysics and cell biology of the deep. |
| | | Lecture 8 | Deep and hot and full of sulfur: Hydrothermal vents | Symbiosis to use chemistryfor food: Life at its hottest and the adaptations this requires |
| | 3-Feb | Lecture 9 | The shallowest: Dual gradients rule the intertidal/ecological interactions | High physical stress versus high biological stress and the way this causes zonation |
| | | Lecture 10 | The biggest - and how they got that way. Lecture by Will Ary. | How predation, competition and facillitation is measured |
| Quiz | 10-Feb | Lecture 11 | The oldest: how long do ocean species live? | Telling the age of fish and whales is difficult:new techniques and the surprising results |
| Product II due | | Lecture 12 | The oldest: the evolution of longevity | Whast evolutionary pressures lead to long and short life spans? |
| Outline for Product III is due | 17-Feb | Lecture 13 | The fastest: flying squid and gliding fish | The fluid mechanics of water rule the way species move quickly in the sea |
| | | Lecture 14 | The coldest: The evolutionary novelty of antifreeze proteins | One family of Antarctic fish has evolved an ice protein. Similar antifreeze adaptations have evolved in parallel elsewhere. |
| Quiz | 24-Feb | Lecture 15 | Strangest family lives: male and female roles | The evolution of life histories. |
| | | Lecture 16 | Stangest family lives: Sex change | Why one gender for life is not always the best strategy. |
| | 3-Mar | Lecture 17 | Future extremes: climate effects on the sea | Sea level rise, acidification, temperature and storms |
| | | Lecture 18 | Future extremes: predictions of future oceans. A grand bargain for the sea | What does the future look like? There is a path that successfully navigates climate change. |
| | 10-Mar | | Final presentations: Multimedia visions of the science and stories of ocean life | |
| Product III group presentatio | | | | |