

EVOLUTION AND SOCIETY

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National Evolutionary Synthesis Center

Evolution 2010: A workshop for Educators

June 21-23, 2010



APPLIED EVOLUTION

- Agriculture – food security, nutrition, pesticide resistance
- Public health – Emerging infectious disease, pathogen evolution
- Medicine – effective and appropriate therapy, new medicines
- Environment – addressing global climate change, conservation



THE CASSAVA STORY



Image credits: David Monniaux, iwata kenichi

PRODUCTION OF CASSAVA

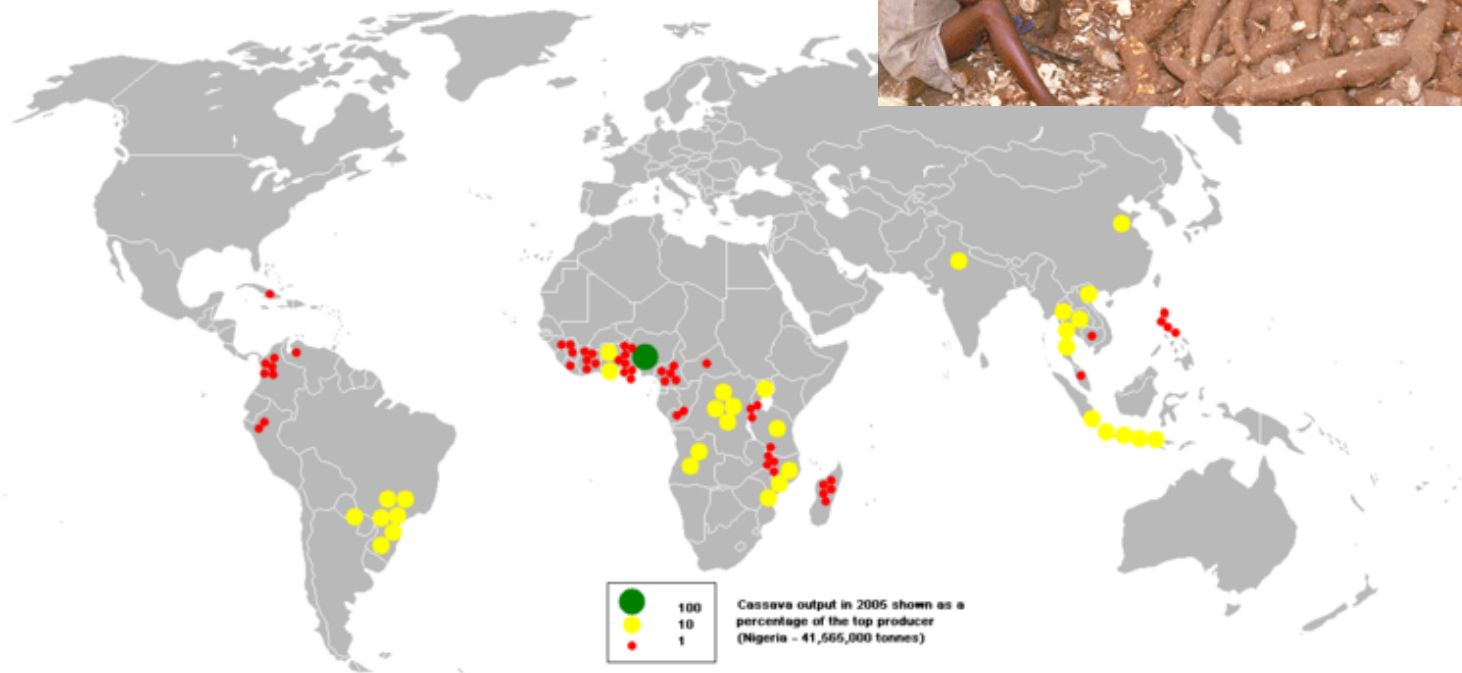
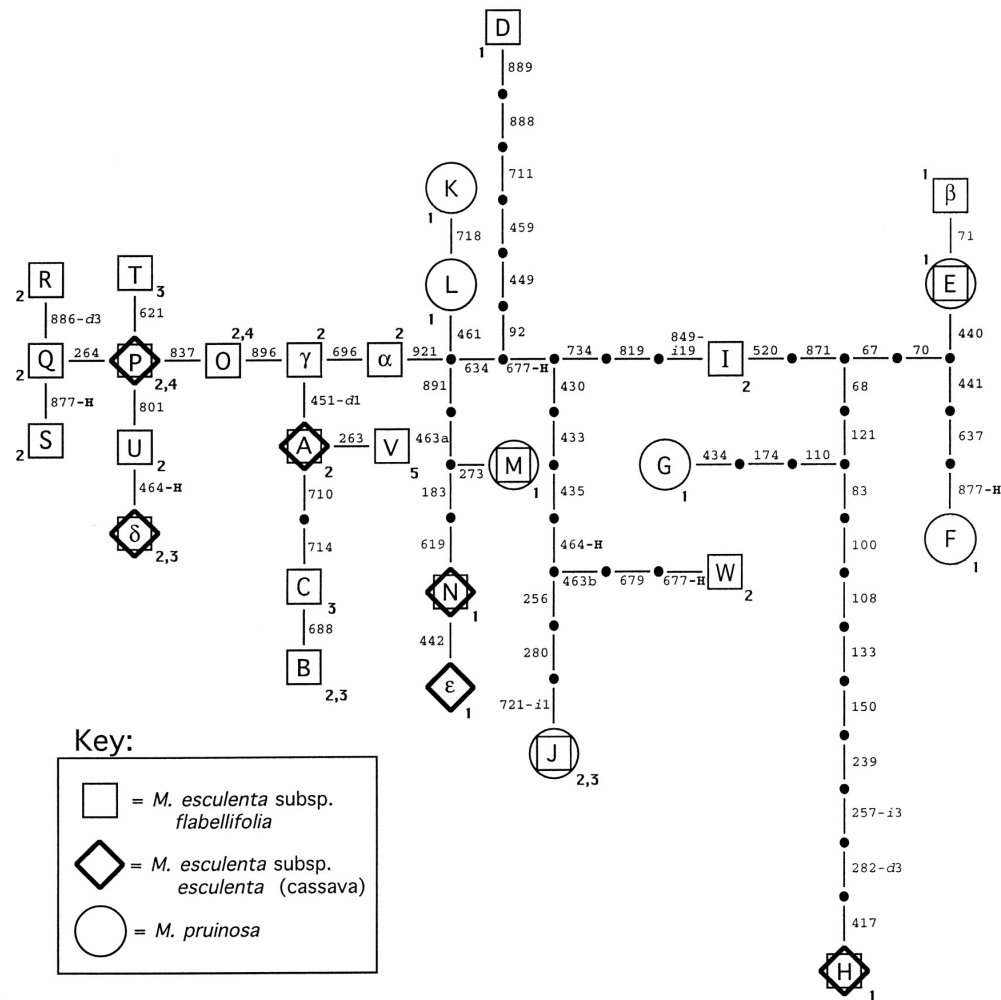


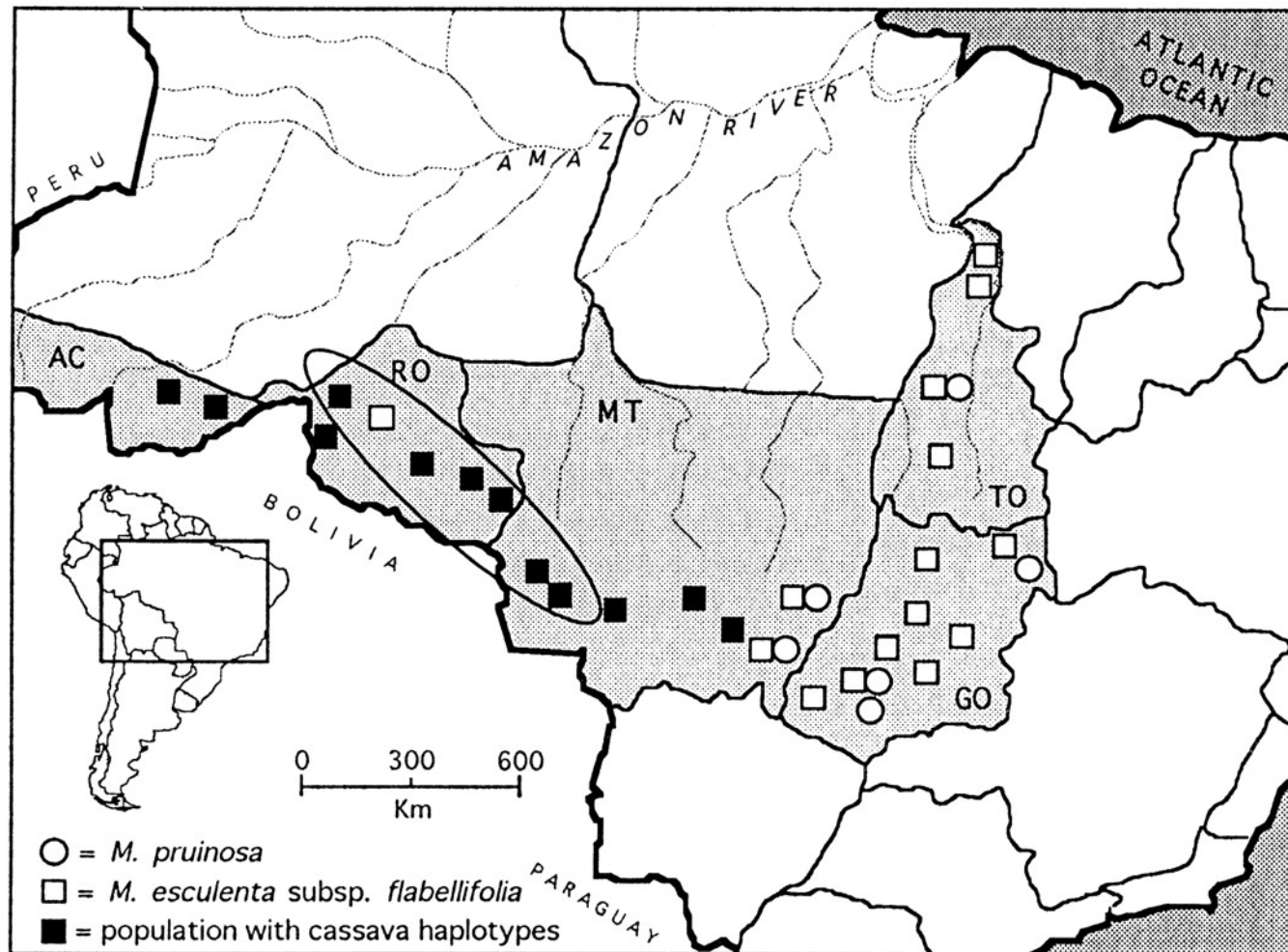
Image credits: IITA, Awar Sasdat

The G3pdh gene tree.



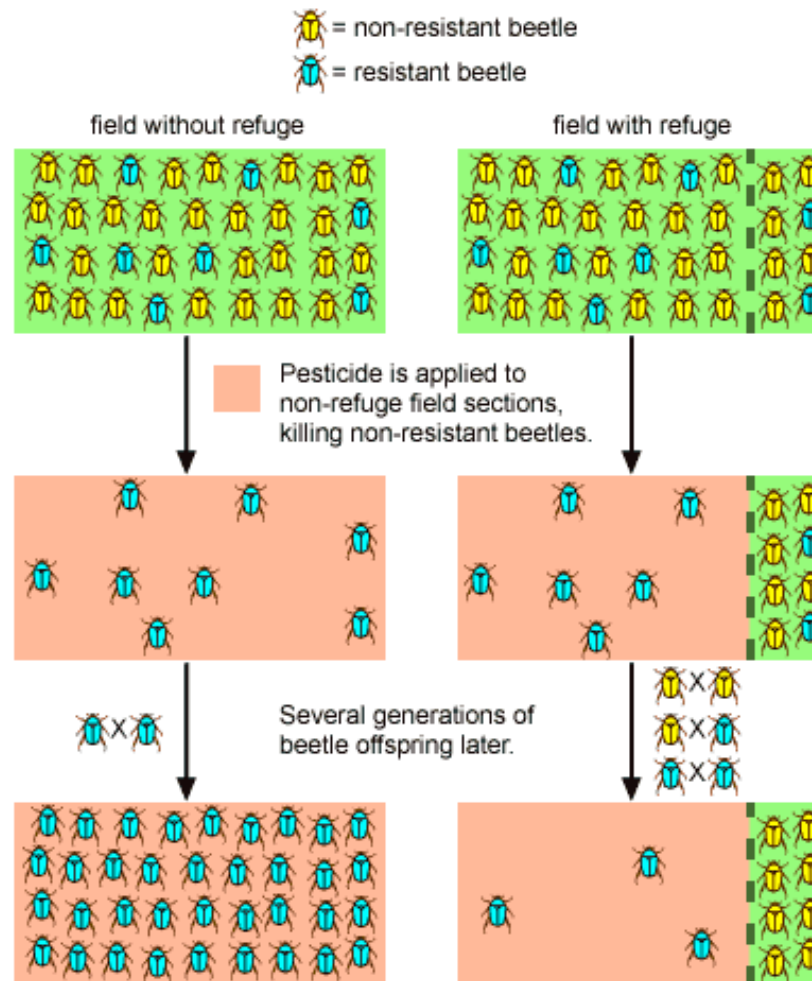
Olsen K M , Schaal B A PNAS 1999;96:5586-5591

Sampling locations for populations of *M. esculenta* subsp.



Olsen K M , Schaal B A PNAS 1999;96:5586-5591

RESISTANCE TO PESTICIDES AND HERBICIDES



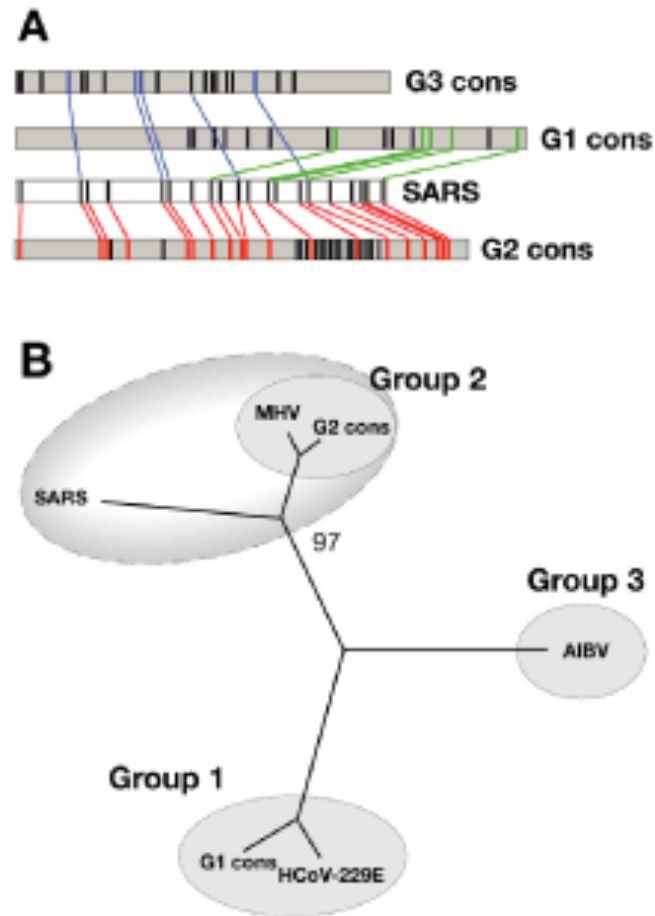
From: Understanding Evolution

EMERGING INFECTIOUS DISEASES

- SARS
- Antibiotic Resistance
- Vaccine development



EVOLUTION AND SARS



UNDERSTANDING SARS



Image Credits: [Praveenp](#), r F. C. Robiller

EVOLUTION AND ANTIBIOTIC RESISTANCE

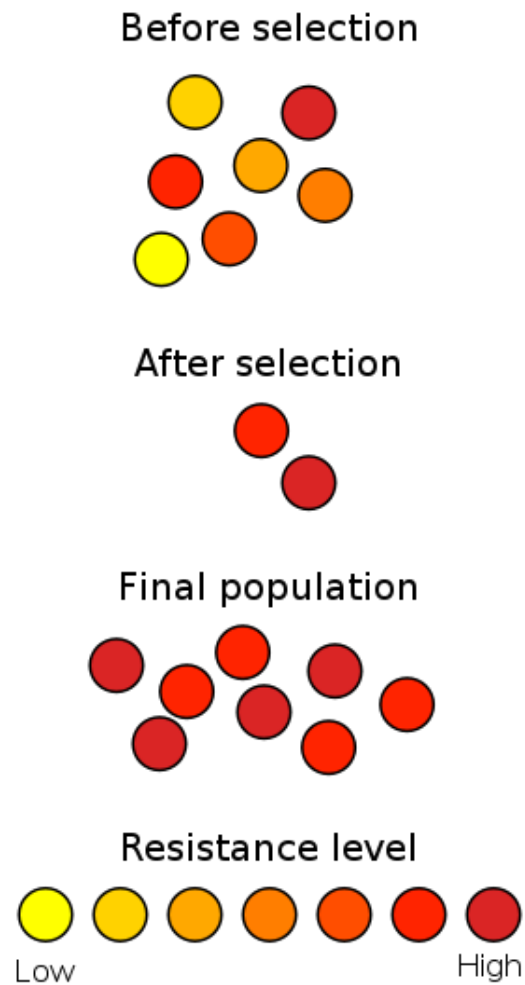


Image Credits: [Wykis](#)

RAPID EVOLUTION IN BACTERIA

Phylogenetic Tree of Life

★ = You are here

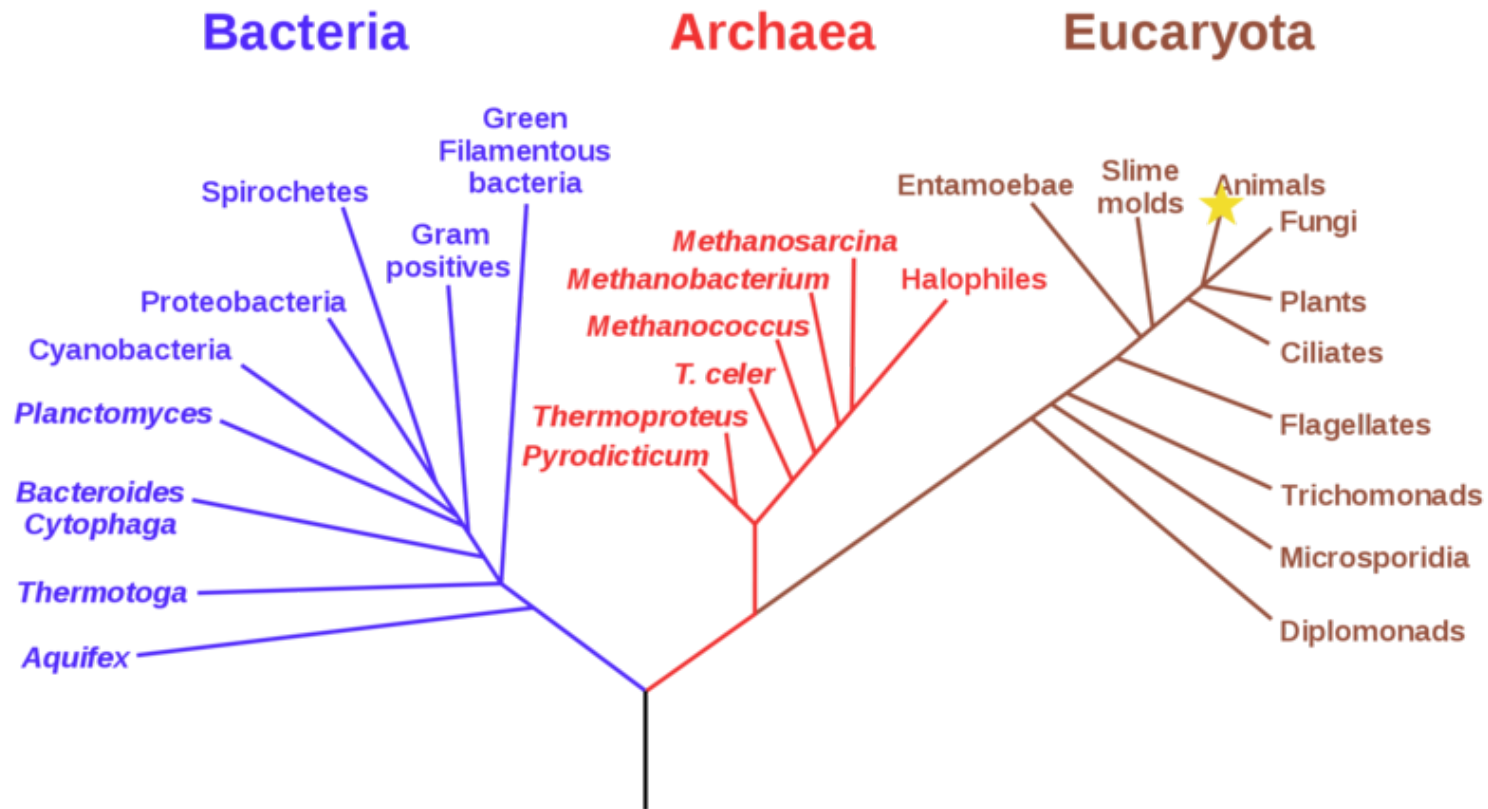
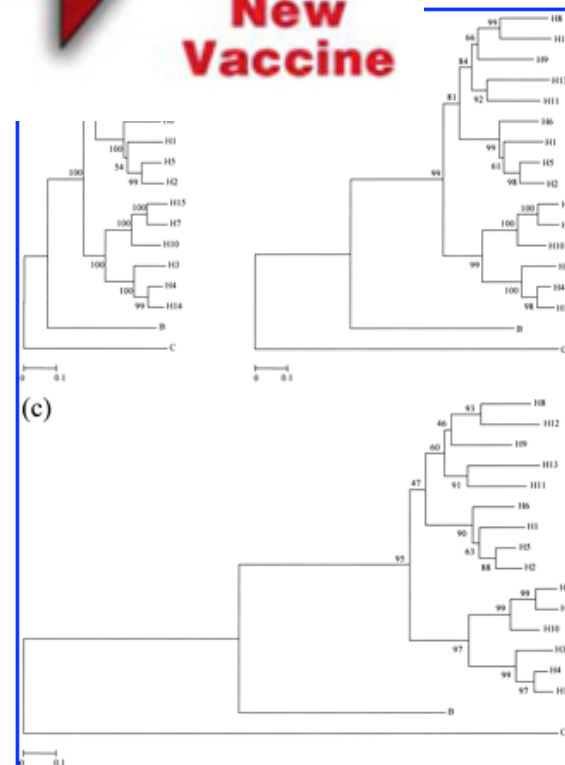


Image Credits: Eric Gaba, AM Smith

INFLUENZA VACCINE

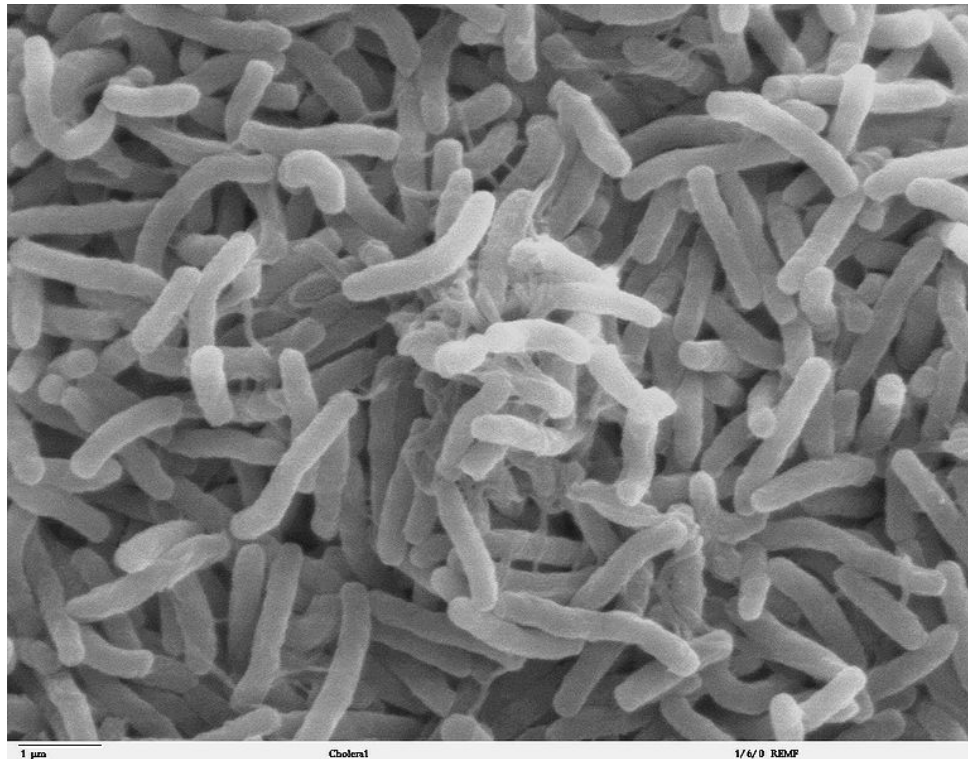
H1N1 Influenza Vaccine Development Process



Images: NIH-NIAID, Yoshiyuki and Nei, 2002

PUBLIC HEALTH MEETS EVOLUTIONARY MEDICINE

- Pathogens/cancers evolve resistance rapidly
- Pathogens evolve strategies to circumvent host defenses, virulence evolves to maximize transmission



T.J. Kim, M.J. Lafferty, C.M.P Sandoe
and R.K. Taylor, 2000 Molecular
Microbiology, Vol. 35(4):896-910



EVOLUTIONARY MEDICINE AND PUBLIC HEALTH

- Host genetic variants that increase disease resistance have a cost, and vice versa
- Humans co-evolved with a “normal” community of bacteria and worms – hygiene hypothesis
- Mismatch to modernity



Image Credits: NHGRI, CDC

EVOLUTIONARY MEDICINE

- The organism as a collection of compromises to maximize reproduction
- Heritable disease is a complex interaction of genetics, environment and development

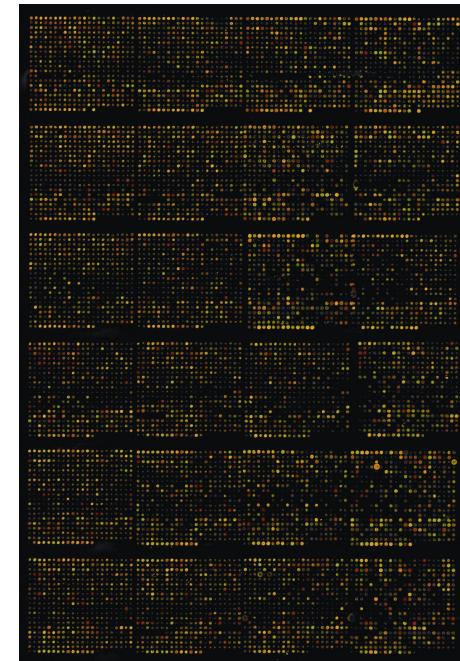


PREGNANCY AND SEXUAL CONFLICT



Image: [Utah State Historical Society](#)

THE HUMAN GENOME AND DISEASE





BIOPROSPECTING



Image Credit: Richard Ling

EVOLUTION AND THE ENVIRONMENT

- Biofuel production
- Conservation



BIOFUELS THROUGH DIRECTED EVOLUTION

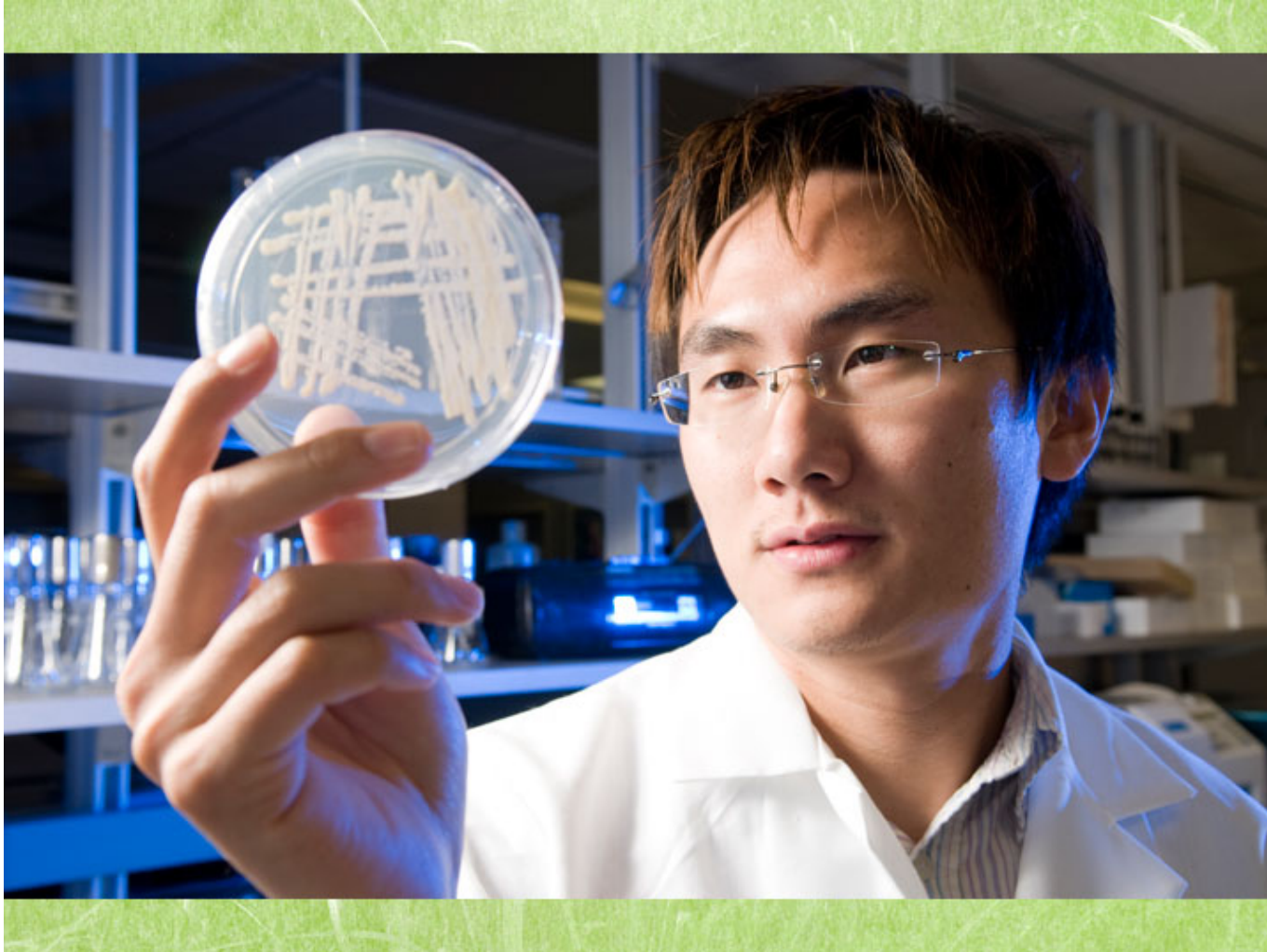
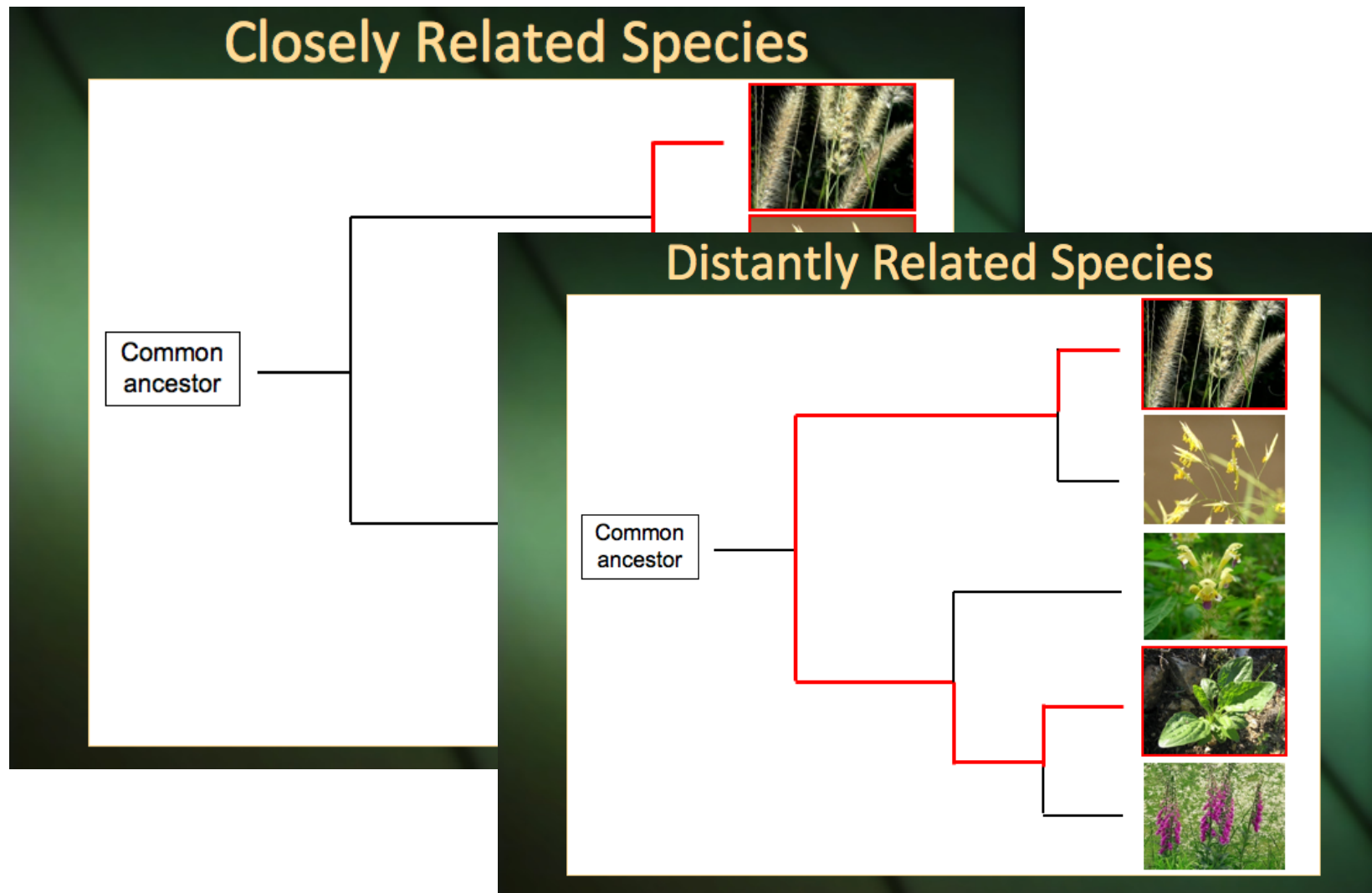


Image Credit: GLBRC

EVOLUTION AND ECOSYSTEM BIO DIVERSITY



Images by MPF, on Wikimedia

EVOLUTION AND ADAPTATION

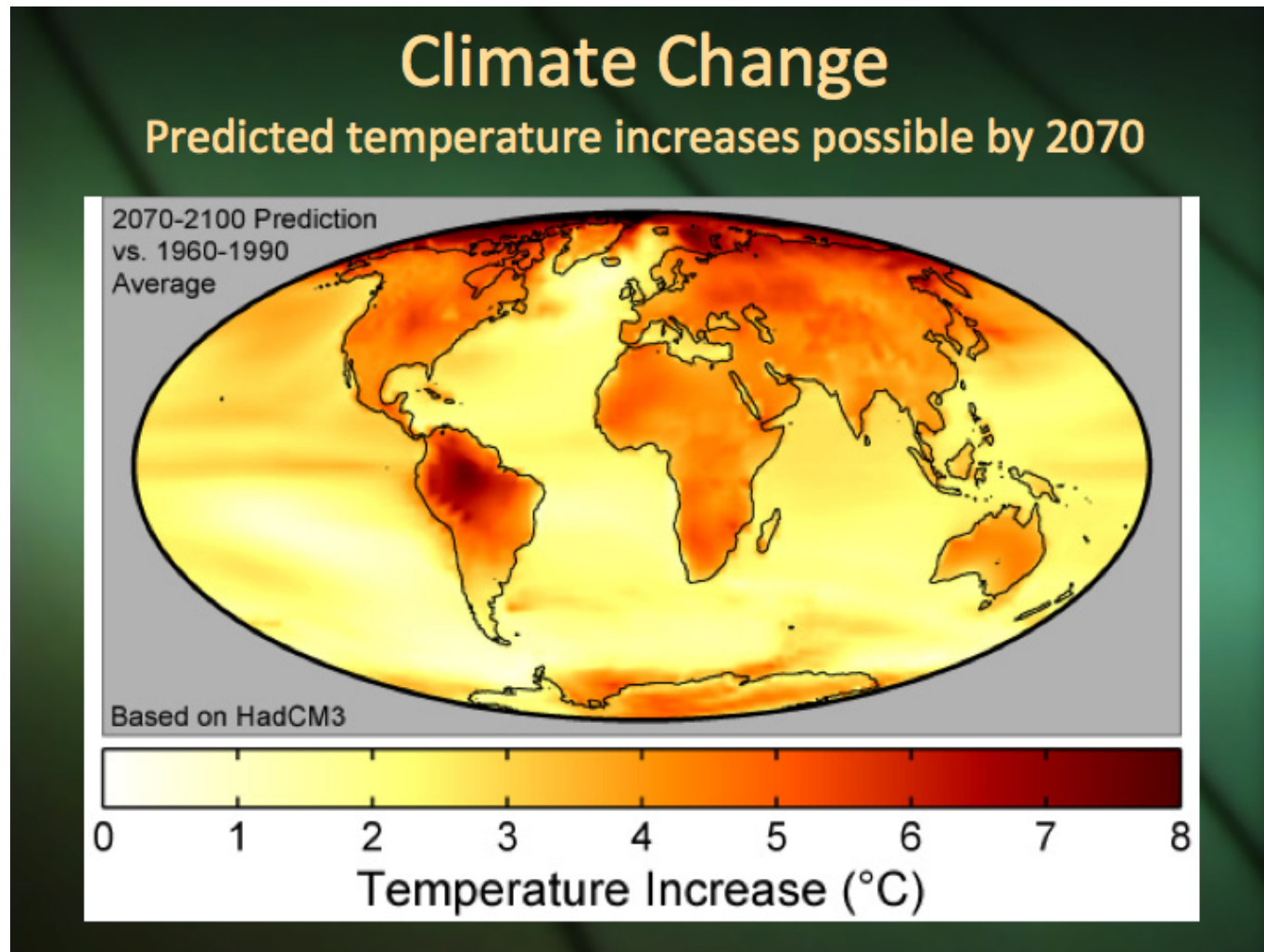


Image by Robert A. Rohde

RESOURCES

- Evolution for Everyone – Sloan Wilson
- Your Inner Fish - Shubin
- Why We Get Sick – Nesse and Williams

