

# “ЭВОЛЮЦИ: ОНОЛ БА ХЭРЭГЛЭЭ” СЭДЭВТ ОЛОН НИЙТЭД ЗОРИУЛСАН ЛЕКЦЭНД ТА БҮХНИЙГ ХҮРЭЛЦЭН ИРЭХИЙГ УРЬЖ БАЙНА

(МУИС-ийн Дугуй танхим)

## ЭВОЛЮЦИ

2013 оны 5 дугаар сарын 23



15.00-15.30 Др. Дуглас Ж. Футуимад МУИС-ийн  
Биологийн салбарын “Хүндэт доктор”  
цол олгох ёслолын ажиллагаа

15.30-17.00 Dr. Douglas J. Futuyma “Evolution:  
theory and applications”

Др. Дуглас Ж. Футуимагийн  
“Эволюци: онол ба хэрэглээ” сэдэвт  
олон нийтэд зориулсан лекц

17.00-18.00 Др. Дуглас Ж. Футуимагийн  
“Эволюци” номын монгол  
орчуулгад гарын үсэг зурах  
ажиллагаа

## ЭВОЛЮЦИ

Холбоо барих хаяг:

Экологийн тэнхим,

Биологи, биотехнологийн сургууль,

Монгол Улсын Их Сургууль,

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Др. Дуглас Ж. Футуима  
АНУ-ын Нью-Йорк мужийн Стоуни Бруук Их Сургуулийн  
Экологи, эволюцийн биологийн тэнхимийн тэргүүлэх профессор

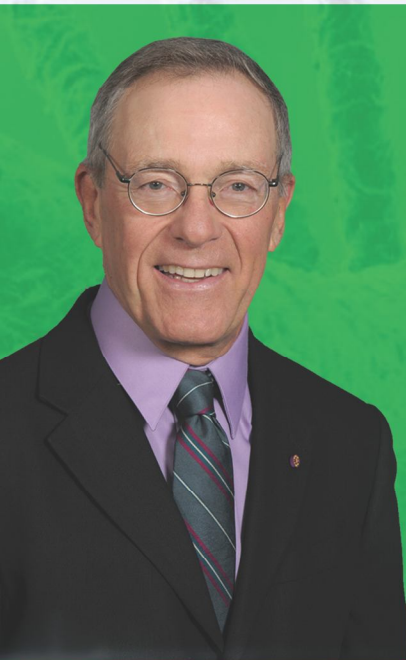
Dr. Douglas J. Futuyma,  
Distinguished Professor, Department of Ecology and Evolution  
State University of New York Stony Brook, NY, USA

ДУГЛАС Ж. ФУТУИМА  
ҮНЭ ТӨЛБӨРГҮЙ



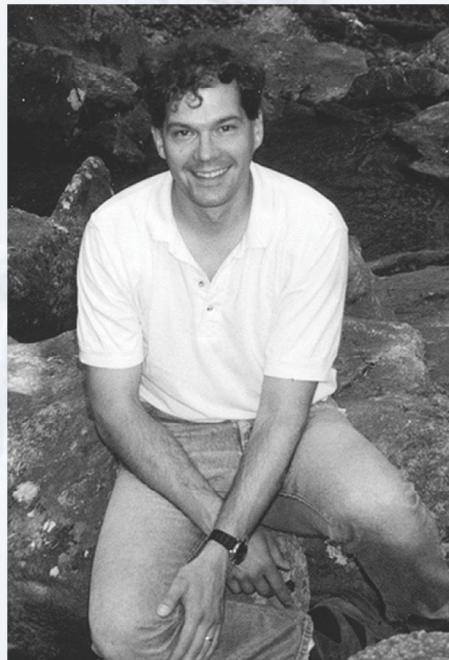
# СУДАЛГААНЫ СЕМИНАРТ ТА БҮХНИЙГ ХҮРЭЛЦЭН ИРЭХИЙГ УРЬЖ БАЙНА

(МОНГОЛ-ЯПОН ТӨВ)



Др. Дуглас Ж. Футуима  
АНУ-ын Нью-Йорк  
мужийн Стоун Брук Их  
Сургуулийн  
Экологи, эволюцийн  
биологийн тэнхимийн  
тэргүүлэх профессор

Dr. Douglas J. Futuyma,  
Distinguished Professor,  
Department of Ecology and  
Evolution, State University of  
New York Stony Brook, NY,  
USA



Др. Пол Сниговски  
АНУ-ын Пенсильваний Их  
Сургуулийн Биологийн  
тэнхимийн профессор

Dr. Paul Sniegowski  
Associate Professor of  
Biology, Department of  
Biology  
University of Pennsylvania,  
Philadelphia,  
PA, USA

2013 оны 5 дугаар сарын 24

**14.30-16.00 Dr. Douglas J. Futuyma “The evolution of insect-plant associations”**

Др. Дуглас Ж. Футуимагийн “Шавьж-ургамлын харилцааны эволюци” сэдэвт судалгааны семинар

**16.00-17.30 Dr. Paul Sniegowski “Going back wards: evidence that mutation over whelms adaptation in hypermutable bacterial populations”**

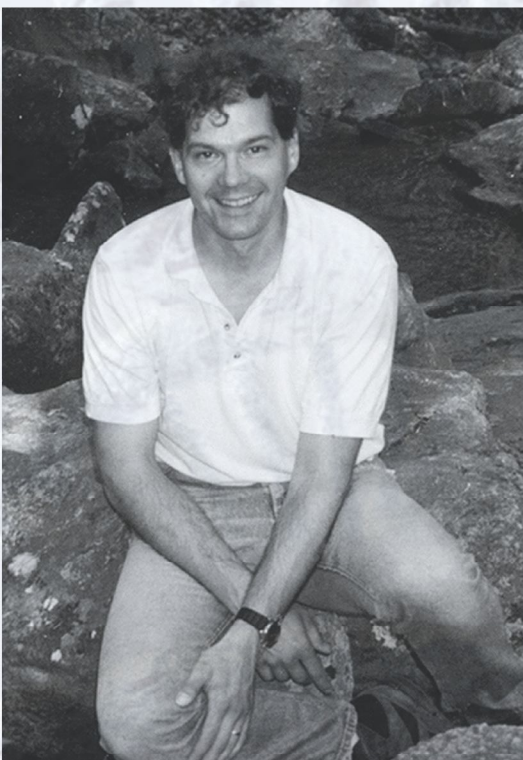
Др. Пол Сниговскийн “Эволюцийн эргэлт: үлэмж хувьсамтгай бактерийн популяцийн зохилдлогоог мутаци дарангуйлдаг болохын нотолгоо” сэдэвт судалгааны семинар

ҮНЭ ТӨЛБӨРГҮЙ

Холбоо барих хаяг:  
Экологийн тэнхим,  
Биологи, биотехнологийн сургууль,  
Монгол Улсын Их Сургууль,  
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# ЭВОЛЮЦИ, ЭКОЛОГИЙН САЛБАРЫН СУДЛААЧ, СОНИРХОГЧДОД ЗОРИУЛАН ХИЧЭЭЛ ЗААХ ТУЛ ТА БҮХНИЙГ ХҮРЭЛЦЭН ИРЭХИЙГ УРЬЖ БАЙНА



Др. Пол Сниговски  
АНУ-ын Пенсильваний Их  
Сургуулийн Биологийн тэнхимийн  
профессор

Dr. Paul Sniegowski  
Associate Professor of Biology  
Department of Biology  
University of Pennsylvania  
Philadelphia, PA, USA

2013 оны 5 дугаар сарын 27  
(Монгол-Япон төв)

Dr. Paul Sniegowski / Др. Пол Сниговски

09.00-12.30 Introduction to the evolution of genetic  
systems (sex and mutation rates)

*Генетик систем (бэлгийн үржил,  
мутацийн эрчим)-ийн эволюцийн  
тухай удиртгал хичээл*

14.00-17.30 Introduction to molecular evolution:  
quantifying sequence variation and the  
logic of detecting selection using sequence  
variation

*Молекул эволюцийн удиртгал:  
ДНХ-ийн дарааллын вариацийг  
тооцоолох, түүнээс шалгарлын нөлөөг  
илрүүлэх хандлага*

2013 оны 5 дугаар сарын 28  
(МУИС-ийн Хичээлийн I байрны 320 тоот)

09.00-12.00 Intermediate quantitative genetics:  
multiple characters, epistasis etc.

*Тоон генетик: олон шинж тэмдэг,  
эпистази г.м.*

**Холбоо барих хаяг:**

Экологийн тэнхим,  
Биологи, биотехнологийн сургууль,  
Монгол Улсын Их Сургууль,  
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ҮНЭ ТӨЛБӨРГҮЙ

# Douglas J. Futuyma, Ph.D.

Distinguished Professor, Stony Brook University, NY, USA  
Ph.D., University of Michigan, 1969

**Research interests:** evolutionary processes, evolutionary ecology, coevolution



Dr. Douglas Futuyma's research interests in evolution focus primarily on speciation and the evolution of ecological interactions among species. He has been a Guggenheim and a Fulbright Fellow, the President of the Society for the Study of Evolution, the American Society of Naturalists, and the American Institute of Biological Sciences, the editor of *Evolution*, and is a member of the National Academy of Sciences. He is editor of the *Annual Review of Ecology, Evolution, and Systematics*, and is the author of the successful textbooks *Evolutionary Biology* and *Evolution*.

Most of his work has centered on the population biology of herbivorous insects and the evolution of their affiliation with host plants. Research on several species centered on genetic differences conferring adaptation to different host plants, and cast light on the evolution of host specificity. Recent work has focussed on whether or not constraints on genetic variation are likely to have influenced the phylogenetic history of host associations in a group of leaf beetles, and on the pattern of speciation in this group. Futuyma's students have worked on diverse evolutionary and ecological studies of insect-plant interactions and of speciation in insects.

## Selected publications:

- Cogni, R., J. R. Trigo, and **D. J. Futuyma**. 2012. A free lunch? No cost for acquiring defensive plant pyrrolizidine alkaloids in a specialist arctiid moth (*Utetheisa ornatrix*). *Molecular Ecology* 21:6152-6162.
- Cogni, R., J. R. Trigo, and **D. J. Futuyma**. 2011. Varying herbivore population structure correlates with lack of local adaptation in a geographically variable plant-herbivore interaction. *PLoS ONE* 6(12):e29220, pp. 1-12.
- Futuyma, D. J.** 2011. Taxonomic issues: What we learn from comparisons among species. Pp. 95-106 in G. Auletta, M. Leclerc, and R. A. Martínez (eds.), *Biological Evolution: Facts and Theories. A Critical Appraisal 150 Years After "The Origin of Species."* Gregorian and Biblical Press, Rome.
- Futuyma, D. J.** 2010. Evolution: the most important theory in biology. Pp. 68-85 in M. Long, H. Gu, and Z. Zhou (eds.), *Darwin's Heritage Today: Proceedings of the Darwin 200 Beijing International Conference*. Higher Education Press, Beijing.
- Futuyma, D. J.** 2010. Evolutionary biology: 150 years of progress. Pp. 3-29 in M. A. Bell, D. J. Futuyma, W. F. Eanes, and J. F. Levinton (eds.), *Evolution Since Darwin: The First 150 Years*. Sinauer, Sunderland, Mass.
- Futuyma, D. J.** 2010. Evolutionary constraint and ecological consequences. *Evolution* 64:1865-1884.
- Futuyma, D. J.**, and A. A. Agrawal. 2009. Macroevolution and the biological diversity of herbivores. *Proc. Nat. Acad. Sci. USA* 106:18054-18061.
- Forister, M.L., A. G. Ehmer, and **D. J. Futuyma**. 2007. The genetic architecture of a niche: variation and covariation in host use traits in the Colorado potato beetle. *J. Evol. Biol.* 20:985-996.
- Gassmann, A. J., A. Levy, T. Tran, and **D. J. Futuyma**. 2006. Adaptations of an insect to a novel host plant: a phylogenetic approach. *Functional Ecology* 20:478-485.
- Vencl, F. V., F. Nogueira de Sá, B. J. Allen, D. M. Windsor, and **D. J. Futuyma**. 2005. Dietary specialization influences the efficacy of larval tortoise beetle shield defenses. *Oecologia* 145:404-414.
- Gassmann, A. J., and **D. J. Futuyma**. 2005. Consequences of herbivory for the fitness cost of herbicide resistance: photosynthetic variation in the context of plant-herbivore interactions. *J. Evol. Biol.* 18:447-454.
- Futuyma, D. J.** 2001. Specialist and generalist strategies. In *Evolutionary Ecology: Perspectives and Synthesis*, ed. C. W. Fox, D. A. Roff, and D. J. Fairbairn. Oxford University Press.
- Knowles, L. L., **D. J. Futuyma**, W. F. Eanes, and B. Rannala. (1999) Insight into speciation from historical demography in the phytophagous beetle genus *Ophraella*. *Evolution* 53:1846-1856.
- Knowles, L. L., A. Levy, J. M. McNellis, K. P. Greene, and **D. J. Futuyma**. 1999. Tests of inbreeding effects on host-shift potential in the phytophagous beetle *Ophraella communa*. *Evolution* 53:561-567.
- Futuyma, D. J.** 1997. Wherefore and whither the naturalist? *Am. Nat.* 151:1-6.
- Futuyma, D. J.**, and C. Mitter. 1996. Insect-plant interactions: The evolution of component communities. *Phil. Trans. Roy. Soc. Lond. B* 351:1361-1366. (reprinted as pp. 253-264 in *Plant Life Histories*, ed. J. Silvertown, M. Franco, and J. L. Harper, Cambridge University Press, 1997.)
- Funk, D. J., **D. J. Futuyma**, G. Ortí, and A. Meyer. 1995. A history of host associations and evolutionary diversification for *Ophraella* (Coleoptera: Chrysomelidae): new evidence from mitochondrial DNA. *Evolution* 49:1017-1022.
- Futuyma, D. J.**, M. C. Keese, and D. J. Funk. 1995. Genetic constraints on macroevolution: The evolution of host affiliation in the leaf beetle genus *Ophraella*. *Evolution* 49:797-809.
- Futuyma, D. J.**, J. Walsh, T. Morton, D. J. Funk, and M. C. Keese. 1994. Genetic variation in a phylogenetic context: Responses of two specialized leaf beetles (Coleoptera: Chrysomelidae) to host plants of their congeners. *J. Evol. Biol.* 7:127-146.
- Futuyma, D. J.**, M. C. Keese, and S. J. Scheffer. 1993. Genetic constraints and the phylogeny of insect-plant associations: Responses of *Ophraella communa* (Coleoptera: Chrysomelidae) to host plants of its congeners. *Evolution* 47:888-905.
- Futuyma, D. J.**, and M. C. Keese. 1992. Evolution and coevolution of plants and phytophagous arthropods. In G. A. Rosenthal and M. R. Berenbaum (eds.), *Herbivores: Their interactions with secondary plant metabolites* (2nd ed.), pp. 439-475. Academic Press, N.Y.
- Mitter, C., B. Farrell, and **D. J. Futuyma**. 1991. Phylogenetic studies of insect-plant interactions: Insights into the genesis of diversity. *Trends Ecol. Evol.* 6:290-293.
- Futuyma, D. J.**, and G. Moreno. 1988. The evolution of ecological specialization. *Annu. Rev. Ecol. Syst.* 19:207-223.
- Futuyma, D. J.** 1988. Sturm und Drang and the evolutionary synthesis. *Evolution* 42:217-226.
- Futuyma, D. J.** 1987. On the role of species in anagenesis. *Amer. Nat.* 130:217-226.
- Futuyma, D. J.**, and T. E. Philippi. 1987. Genetic variation and covariation in responses to host plants by *Alsophila pometaria* (Lepidoptera: Geometridae). *Evolution* 41:269-279.
- Futuyma, D. J.**, and S.S. Wasserman. 1981. Food plant specialization and feeding efficiency in the tent caterpillars *Malacosoma disstria* Hübner and *M. americanum* (Fabricius). *Ent. Exp. Appl.* 30:106-110.
- Mitter, C., **D. J. Futuyma**, J.C. Schneider, and J.D. Hare. 1979. Genetic variation and host plant relations in a parthenogenetic moth. *Evolution* 33:777-790.



# Paul D. Sniegowski, Ph.D.

Associate Professor of Biology, University of Pennsylvania, PA, USA  
Ph.D., University of Chicago, 1993

**Research interests:** population and evolutionary genetics as a framework for understanding the evolutionary significance of mutation rates and mutational phenomena



Because the ultimate source of genetic variation is mutation, the evolution of mutation rates is a subject of basic interest in genetics. Considerable health implications exist as well: Recent findings have linked high somatic mutation rates with certain cancers, and high mutation rates have also been linked to pathogenicity in *E. coli* and *Salmonella*. Defective methyl-directed mismatch repair (hereafter, MMR) is implicated as the underlying mechanistic basis for high mutation rates in both of these cases. However, the basis for the evolutionary success of MMR-defective alleles remains to be examined rigorously. Dr. Sniegowski is currently studying experimental populations of the bacterium *Escherichia coli* in which strikingly elevated general mutation rates have evolved. Genetic complementation analyses have shown that these high mutation rates are caused by defects in the MMR pathway. Dr. Sniegowski using classical and molecular genetic approaches to manipulate and characterize the specific MMR defects responsible for the evolution of mutation rates, and he is pursuing experimental and theoretical population genetic studies to examine the causes of mutation rate evolution.

The genomes of virtually all organisms well studied at the molecular level harbor transposable elements (TEs), which are genetic entities capable of replicating faster than host DNA and inserting replicas into new genomic locations. TEs have been the subject of considerable speculation and interest; opinion is broadly divided over whether they are of functional or adaptive value or are best regarded as parasitic (selfish) entities. Surveys of TEs in natural *Drosophila melanogaster* populations have supported the selfish DNA view: TEs are rare at occupied genomic sites, as would be expected on a balance between selective elimination and replicative transposition. Very little is known, however, about the population biology of TEs in other taxa. Dr. Sniegowski has recently initiated a project to study the population genetics of Ty elements in the wild yeast *Saccharomyces paradoxus*, a close congener to the domesticated brewer's yeast *S. cerevisiae*. The early stages of this project are providing novel information on the structure of wild yeast populations, and this information will be used as a baseline for future studies of the significance of Ty elements.

## Selected publications:

- Bataillon, T., P. Joyce and **P. D. Sniegowski**. 2012. As it happens: current directions in experimental evolution. *Biol. Lett.* 9: 20120945.
- Gerrish, P. J. and **P. D. Sniegowski**. 2012. Real time forecasting of near-future evolution. *J. R. Soc. Interface* 9: 2268-2278.
- Raynes, Y., M. R. Gazzara and **P. D. Sniegowski**. 2012. Contrasting dynamics of a mutator allele in asexual populations of differing size. *Evolution* 66: 2329-2334.
- Gentile, C. F., S. Yu, S. A. Serrano, P. J. Gerrish and **P. D. Sniegowski**. 2011. Competition between high- and higher-mutating strains of *Escherichia coli*. *Biol. Lett.* 7: 422-424.
- Raynes, Y., M. R. Gazzara and **P. D. Sniegowski**. 2011. Mutator dynamics in sexual and asexual experimental populations of yeast. *BMC Evolutionary Biology* 11:158 doi:10.1186/1471-2148-11-158.
- Sniegowski, P. D.** and P. J. Gerrish. 2010. Beneficial mutations and the dynamics of adaptation in asexual populations. *Phil. Trans. R. Soc. B* 365: 1255-1263.
- Gerrish, P. J., A. Colato, A. S. Perelson, and **P. D. Sniegowski**. 2007. Complete genetic linkage can subvert natural selection. *Proceedings of the National Academy of Sciences of the USA* 104:6266-6271.
- Kuehne, H. A., H. A. Murphy, C. A. Francis, and **P. D. Sniegowski**. 2007. Allopatric divergence, secondary contact and genetic isolation in wild yeast populations. *Current Biology* 17:407-411.
- Sniegowski, P. D.** and H. A. Murphy. 2006. Evolvability. *Current Biology* 16:R831-R834.
- Fay, J. C., H. L. McCullough, **P. D. Sniegowski**, and M. B. Eisen. 2004. Population genetic variation in gene expression is associated with phenotypic variation in *Saccharomyces cerevisiae*. *Genome Biology* 5.
- Sweeney, J. Y., H. A. Kuehne, and **P. D. Sniegowski**. 2004. Sympatric natural *Saccharomyces cerevisiae* and *S. paradoxus* populations have different thermal growth profiles. *Fems Yeast Research* 4:521-525.
- Shaver, A. C. and **P. D. Sniegowski**. 2003. Spontaneously arising mutL mutators in evolving *Escherichia coli* populations are the result of changes in repeat length. *Journal of Bacteriology* 185:6076-6082.
- Bonhoeffer, S. and **P. D. Sniegowski**. 2002. Virus evolution – The importance of being erroneous. *Nature* 420:367.
- Sniegowski, P. D.**, P. J. Gerrish, T. Johnson, and A. Shaver. 2000. The evolution of mutation rates: separating causes from consequences. *Bioessays* 22:1057-1066.
- Sniegowski, P.** 1999. Evolution: The genomics of adaptation in yeast. *Current Biology* 9:R897-R898.
- Naumov, G. I., E. S. Naumova, and **P. D. Sniegowski**. 1997. Differentiation of European and Far East Asian populations of *Saccharomyces paradoxus* by allozyme analysis. *International Journal of Systematic Bacteriology* 47:341-344.
- Charlesworth, B., C. H. Langley, and **P. D. Sniegowski**. 1997. Transposable element distributions in *Drosophila*. *Genetics* 147:1993-1995.
- Sniegowski, P. D.**, P. J. Gerrish, and R. E. Lenski. 1997. Evolution of high mutation rates in experimental populations of *E. coli*. *Nature* 387:703-705.
- Sniegowski, P. D.** and R. E. Lenski. 1995. Mutation and adaptation - the directed mutation controversy in evolutionary perspective. *Annual Review of Ecology and Systematics* 26:553-578.
- Charlesworth, B., **P. Sniegowski**, and W. Stephan. 1994. The evolutionary dynamics of repetitive DNA in eukaryotes. *Nature* 371:215-220.
- Sniegowski, P. D.** and B. Charlesworth. 1994. Transposable element numbers in cosmopolitan inversions from a natural population of *Drosophila melanogaster*. *Genetics* 137:815-827.
- Coyne, J. A., W. Meyers, A. P. Crittenden, and **P. Sniegowski**. 1993. The fertility effects of pericentric inversions in *Drosophila melanogaster*. *Genetics* 134:487-496.