@NESCent

FALL 2012 VOLUME 4 No. 3 www.nescent.org

Newsletter of the National Evolutionary Synthesis Center, an NSF-funded collaborative research center operated by Duke University, the University of North Carolina at Chapel Hill, and North Carolina State University.

IN THIS ISSUE:

NEXT PROPOSAL DEADLINES:

NESCent has hosted nearly 5000 scientists from more than 50 countries. You could be one of them. We are now welcoming applications for the following:

Dec. 1: sabbaticals, catalysis meetings and working groups

Jan. 1: graduate fellowships, short-term visitors

Jan. 15: journalists-in-residence

For more information, turn to page 6 or visit **nescent.org/science/proposals.php**

JOB OPENINGS

Interested in employment opportunities at NESCent? Our center runs with the help of a dynamic team of programmers, financial experts, event planners, and other specialists. To find out about job openings as they become available, visit **nescent.org/about/employment.php**.

RESEARCH HIGHLIGHTS

Market in Istanbul, Turkey. PHOTO COURTESY WIKIMEDIA CONTRIBUTOR DONNYHOCA

Mapping the birthplace of the world's largest language family

Using phylogeographic methods for tracking the origin and spread of virus outbreaks, NESCent researchers have mapped the birthplace of the Indo-European language group, a family of hundreds of languages and dialects spoken by nearly three billion native speakers throughout Europe and Asia.

The findings, published in the August 24, 2012 issue of *Science*, suggest that the language family arose 8,000 to 9,500 years ago in present-day Turkey.

The results also help solve a longstanding debate in language evolution.

Dutch, Spanish, Russian, Greek and Hindi may all sound very different, but they have certain sounds and meanings in common. Take *moeder* in Dutch, madre in Spanish, *mat'* in Russian, *mitéra* in Greek and *Mām* in Hindi — all of which mean mother.

"Instead of comparing viruses, we compare languages, and instead of DNA, we looked for shared cognates, or words that have a common origin."

–Quentin Atkinson, University of Auckland

Based on these and other similarities, researchers infer that hundreds of languages across Europe and Asia share a common ancestor. But just when and where this

see LANGUAGE, p 8

ABOUT NESCENT:

NESCent is a scientific research center dedicated to cross-disciplinary research in evolution. The center's mission is to promote the synthesis of information, concepts and knowledge to address significant, emerging, or novel questions in evolutionary science and its applications. NESCent achieves this by supporting research and education across disciplinary, institutional, geographic, and demographic boundaries.

NESCent is a collaborative partnership between Duke University, the University of North Carolina at Chapel Hill, and North Carolina State University, and is funded by the National Science Foundation (award #EF-0905606). For more information about research and training opportunities at NESCent, visit **www.nescent.org.**

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Subscribe to the NESCent quarterly newsletter to receive news about the Center, research and training opportunities, and upcoming events. Comments, story ideas and photo contributions are welcome. Please send corrections and suggestions for future newsletters to Robin Smith at rsmith@nescent.org

To unsubscribe fill out our online form at bit.ly/qIuEWu. You can also visit NESCent on Twitter, Facebook, and YouTube.

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Letter from the director

NESCent is not a funding agency. Sometimes it is easy to forget this, because the things that we do — soliciting proposals, supporting postdocs, graduate students and sabbatarians — are the sorts of things that funding agencies do. But unlike many funding agencies, everything that we do is driven by what the community needs, and by our own mission. For this reason, when our Advisory Board recommends that we support a proposal, they do so because they think that the research is something that would fit well at NESCent. We see the science at the center as a partnership between the Center and the scientists. For this reason, we don't hand over any funds to the groups we support, nor do we ask researchers to specify a budget in their proposals. If we commit to supporting a group or an individual, we work with them to provide what they need — the informatics, administrative, and logistic services — to allow them to focus on the science.

ALLEN RODRIGO

In this regard, NESCent is like an "incubator," helping to jumpstart ideas and research in evolutionary synthesis that would otherwise have difficulty getting off the ground because of lack of funding or infrastructural support. In much the same ways that business incubators help start-up companies find their feet by providing legal, financial, and advisory services, NESCent is a science incubator: we provide researchers with the services they need so that their (frequently, high-risk) projects have the highest probability of success.

In this issue, you will read about some of the work that has gone on at NESCent, or as a result of NESCent's involvement, that otherwise might not have happened — from adapting disease-mapping methods to solve longstanding debates in language evolution, to developing new tools for measuring scholarly impact beyond traditional impact metrics, to examining the origin of bipedalism to better treat foot and back pain today.

As always, we look forward to seeing you at NESCent. Happy reading!

COMING SOON

Supporting Chicano and Native American scientists

What: SACNAS national conference

When: October 11-13, 2012

Where: Seattle, WA

NESCent is once again partnering with several organizations to put together an exciting suite of activities at the annual meeting of the Society for the Advancement of Chicanos and Native Americans in Science, also known as SACNAS, to be held this October in Seattle, WA.

The theme of this year's conference is "Creating a healthy world through science, diversity and technology." In keeping with that theme, our 2012 lineup of activities includes a scientific symposium entitled "Evolution and ecology: impacting the health of our planet and ourselves", featuring three speakers (NESCent Postdoc Kate Hertweck, NIMBioS Postdoc Calistus Ngonghala and Univ. of Washington researcher Josh Herbeck). Additional activities will include an evolution/ecology career mentoring session, and our ever-popular movie night. This year's movie will be the suspense-thriller "Contagion," which centers on a rapidly evolving virus and the pandemic it causes. Dr. Herbeck, an expert on viral evolution, will lead a discussion/Q&A after the movie.

As always, the goal of these activities is to expose underrepresented minority students to ecology and evolution in greater depth, and to excite them about pursuing graduate studies and careers in these fields.

If you are attending the SACNAS conference this year, please plan to participate!

This year's co-sponsors include AIBS, BEACON, NCEAS, NIMBioS and SSE. For more information, contact Dr. Jory Weintraub at jory@nescent.org.

COMING SOON

NABT evolution symposium pays tribute to Margulis and Crow

What: National Association of Biology Teachers (NABT) Annual Evolution Symposium

Where: November 2, 2012, 1:00 to 5:00 PM (Central time)

When: Dallas, TX

If you're planning on attending the annual meeting of the National Association of Biology Teachers (NABT) this November in Dallas, you won't want to miss the NABT Evolution Symposium. This year's symposium will highlight the impact of two transformational thinkers in evolutionary biology who died in 2011: Lynn Marguils and Jim Crow. The symposium will begin with an overview and historical perspective of major transitions in evolutionary biology, followed by several scientists who are protégés of Margulis and Crow and can speak to the impact of their mentors' work. The symposium will close with a talk on the future of evolutionary biology and the roles of Margulis' and Crow's works in helping shape that future. The symposium is organized and sponsored by NESCent, AIBS and BEACON.

You can find the talks, along with activities, websites and other resources related to this year's symposium, after the meeting at nescent.org/media/NABTSymposium2012.php.

NESCent is also introducing a new initiative to NABT this year: The NESCent Evolution Scholar program is a travel award that will send enthusiastic and dedicated teachers (one, each, from high school and community college) to the conference to acquire new knowledge and pedagogical skills, which they will then share with their students (through classroom activities) and colleagues (through professional development activities).

COMING SOON

Win a travel award for best evolution-themed blog

Are you a blogger who is interested in evolution? The National Evolutionary Synthesis Center is offering two travel awards to attend **ScienceOnline2013**, a science communication conference to be held January 30 through February 2, 2013 at North Carolina State University in Raleigh, NC.

The awards offer the opportunity to travel to North Carolina to meet with several hundred researchers, writers, editors and educators to explore how online tools are changing the way science is done and communicated to the public. Each winner will receive $750 to cover travel and lodging expenses to attend the conference. For more information about the program for this year's conference, visit http://scio13.wikispaces.com/.

To apply for an award, writers should submit a blog post that highlights current or emerging evolutionary research. In order to be valid, posts must deal with research appearing in the peer-reviewed literature within the last five years. Posts should be 500-1000 words, and must mention the NESCent contest. Two recipients will be chosen by a panel of judges from both NESCent and the science blogging community. Please send your name, contact information, the title and date of your blog post, and a URL to **travel.award@nescent.org**. Winners will be notified by December 15th, 2012.

For more information contact Craig McClain at **cmcclain@nescent.org**, or

Robin Smith at **rsmith@nescent.org**.

RESEARCH HIGHLIGHTS

Measuring scholarly impact beyond the library and the lab

If you're a scholar, how do you know if the work you do is influential? Researchers, universities and publishers have traditionally measured the impact of scholarly work by counting the number of publications, and how often those publications have been cited.

But in a world where research comes in many forms, articles and citations are only part of the story.

What traditional impact metrics don't catch are scholarly contributions that don't come in standard journal article form, such as datasets, software and code, all of which influence research and teaching in ways that aren't reflected in the citation record.

Biologist Amy Zanne of George Washington University understands this first hand.

In the mid-2000s, Zanne and colleagues began compiling data for what would eventually become the largest wood density database to date — representing wood densities for more than 8400 plant taxa worldwide.

"It's a one-stop shop for wood density data," Zanne said.

NESCent's Heather Piwowar (above) and her colleague Jason Priem at the University of North Carolina at Chapel Hill are co-creators of a recently-funded altmetrics tool called Total Impact.

"Scholars make all sorts of contributions that are almost invisible." –Todd Vision, UNC Chapel Hill, NESCent

In 2009, Zanne uploaded the data to a digital data repository for other researchers to use. And use it they did. The data set has since been downloaded nearly 3,000 times, making it the most downloaded data set in the Dryad data repository.

"The database is being used in lots of different countries, and not just in academic settings — It's also showing up in technical reports and white papers from agencies like Earthwatch and the Forest Service —so the data are also helping to inform policy to some degree," Zanne said.

What's less clear is how this kind of research productivity will be measured or evaluated.

"Scholars make all sorts of contributions that are almost invisible," said UNC Chapel Hill biologist Todd Vision. "The impact of those things isn't currently being measured, because they don't count towards annual review or tenure and promotion packages," Vision added.

A new movement called altmetrics — short for alternative metrics — aims to provide a more complete and timelier picture of all the different ways that scholars contribute to their field and the impact and reach of their work.

It takes months and even years for citations to accumulate. But altmetrics tools such as Total Impact (total-impact.org/), for example, give up-to-date impact data in minutes, not months.

Thanks to a $125,000 grant from the Sloan Foundation, the team of researchers behind the Total Impact project have developed a web application that collects and displays a wide range of usage information. Citations, to be sure, but also downloads of data, discussion of papers on blogs, media coverage, and other indicators that the work is being noticed.

Advocates argue that Total Impact and other altmetrics tools have the added benefit of capturing usage patterns by users outside the ivory tower, such as industry practitioners and the lay public — thus capturing a broader picture of who's using your work and how. ●

Learn more at altmetrics.org/manifesto/.

Citation: Zanne AE, Lopez-Gonzalez G, Coomes DA, Ilic J, Jansen S, Lewis SL, Miller RB, Swenson NG, Wiemann MC, Chave J (2009) Data from: Towards a worldwide wood economics spectrum. Dryad Digital Repository. doi:10.5061/dryad.234 .

RECOGNITION

Congratulations to the winners of the 2012 Evolution Film Festival

The votes are in! Nearly 200 people viewed and voted on their favorite short videos in the 2012 evolution film festival in Ottawa on Saturday July 7. We screened 14 short evolution-themed films, each one three minutes or less. Each film got at least one first place vote.

The winners are "The evolution of an alternative male mating strategy: socializing with less attractive rivals," submitted by Cedric Tan and colleagues of the Edward Grey Institute of Field Ornithology (1st place), and "Lessons from Evolution: Dating with Darwin," submitted by Megan Head and Amber Teacher of the University of Exeter (2nd place).

The first- and second-place winners will receive a travel allowance of up to $1,000 and $500, respectively, for travel expenses to attend the scientific meeting of their choice. Thanks to our filmmakers for some fabulous films. Watch this year's finalists at filmfestival.nescent.org/2012-entries/.

Stills from the first-place winning film (above), and second-place winner (below).

Check out the new Dryad button!

Here's a nice way to brighten up the list of publications on your CV or website – the Dryad data repository now has a button you can use to indicate that the associated data is available in the repository.

You can add this button to citations, embedding a link to the Dryad data, allowing anyone who sees the list of publications to also directly access the associated data (and to see that you're a supporter of making data available).

You can download the button from bit.ly/KPXdoZ.

AWARDS

Congratulations to the newest award recipients for 2012

NESCent is pleased to announce the following new awards:

GRADUATE FELLOWS

Gaurav Vaidya (University of Colorado) *LinkedNames: a nomenclatural database for name reconciliation*

Yasmin von Dassow (Duke University) *Ecology and phylogenetic history as predictors of developmental mode in marine gastropods*

SHORT-TERM VISITORS

Patricia Cabezas (Brigham Young University) *The anomuran morphospace: testing alternative evolutionary pathways and diversification patterns in a highly disparate clade*

Wim Hordijk (SmartAnalytiX.com) *Evolution and excess complexity*

Aaron Hunter (Petronas University of Technology) *The evolutionary development of species gradient and hybridization in indo-pacific deep water crinoid populations*

Lee Hsiang Liow (University of Oslo, Norway) *The effects of sampling on the inference of the timing of diversifications*

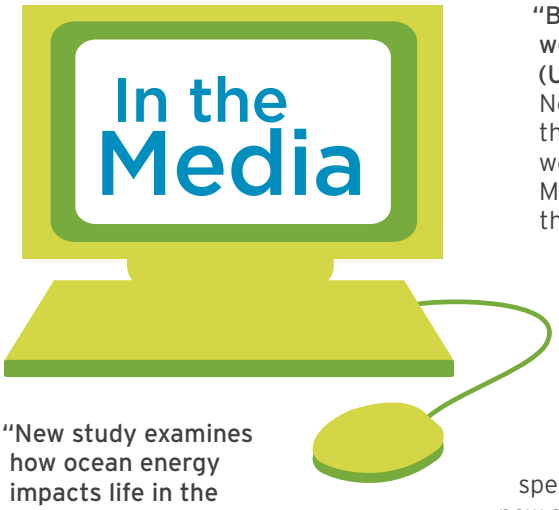
Beren Robinson (University of Guelph) *Predicting relationships between trait mean and plasticity in flexible organisms*

Rachel Rodman (London, UK) *"Branches springing from one root": new lectures in evolution, incorporating themes from Shakespeare's plays*

Evolution Education Award from the National Association of Biology Teachers (co-sponsored by NESCent and the Biological Sciences Curriculum Study)

James Krupa (University of Kentucky)

For more information about these scholars and their research projects, please visit http://www.nescent.org/science/awards.php.



"New study examines how ocean energy impacts life in the deep sea" (Eurekalert) A new study of deep-sea species across the globe aims to understand how natural gradients in food and temperature in the dark, frigid waters of the deep sea affect the snails, clams, and other creatures that live there. Similar studies have been conducted for animals in the shallow oceans, but our understanding of the impact of food and temperature on life in the deep sea – the Earth's largest and most remote ecosystem – has been more limited. The results will help scientists understand what to expect in the deep sea under future climate change, the researchers say. Read more at **bit.ly/REJyS9.**

"Birds that live with varying weather sing more versatile songs" (UK Daily Mail) A new study of North American songbirds reveals that birds that live with fluctuating weather are more flexible singers. Mixing it up helps birds ensure that their songs are heard no matter what the habitat, the researchers say. Find out more at **bit.ly/OEDdIM.**

"Extinction risk factors for New Zealand birds today differ from those of the past" (Eurekalert) What makes some species more prone to extinction? A new study of nearly 300 species of New Zealand birds – from pre-human times to the present – reveals that the keys to survival today differ from those of the past. The results are important for the growing number of studies that try to predict which species could be lost in the future based on what kinds of species are considered most threatened today, the researchers say. Learn more at **bit.ly/MftyAc.**

"Gene data to hit a milestone" (Nature Magazine) With nearly one million gene-expression data sets now in public repositories, researchers can study disease trends without ever having to enter a lab. NESCent's Heather Piwowar weighs in on a milestone in publicly available data in Nature Magazine: **http://bit.ly/SGBvmT.**

"An evolutionary theory of dentistry" (Science Magazine) Why are our teeth so rotten? Cavities, gum disease, dental defects, crooked and crowded teeth, tooth loss – these problems are common today, but they are rare in traditional foraging peoples, and almost unknown in our distant ancestors. Some say that many of these dental health problems result from a mismatch between the foods we eat today – which are rich in sugar and carbohydrates – and those to which our ancestors were adapted. NESCent scientists examine the mismatch between our diets and lifestyles and those of our ancestors in a recent issue of Science Magazine: **bit.ly/KPYPOg.**

"The burdens of being a biped" (Science Magazine) Got back or foot pain? A NESCent working group examines the evolutionary origins of joint and soft tissue problems that uniquely plague humans, such as sprained ankles, hernias, and hip fractures. By understanding how our anatomy changed in order to walk upright, and why these changes occurred, they hope to better understand the causes of these conditions and possibly develop new methods of diagnosing or treating them. Learn more about the burdens of being a biped in a recent issue of Science Magazine: **bit.ly/NfdumJ**.

Call for proposals

Looking for support for a graduate student, faculty sabbatical, short-term visit or meeting? NESCent welcomes your proposals. We are looking to support innovative approaches to outstanding problems in evolutionary biology. In particular, proposals that have a clear interdisciplinary focus, or involve evolutionary concepts in non-traditional disciplines, are strongly encouraged, as are proposals that demonstrate international participation and a mix of senior and emerging researchers, including graduate students.

Proposals for short-term visits are 2 weeks to 3 months. Proposals for sabbaticals may be for up to a full year. The next deadline for sabbaticals, catalysis meetings and working groups is December 1. For short-term visitors and graduate fellowships, the next deadline is January 1.

For more information, please visit nescent.org/science/proposals.php.

PUBLICATIONS

Recent publications by NESCent authors

Andrews, T., R. Price, et al. (2012). "Biology undergraduates' misconceptions about genetic drift." CBE--Life Sciences Education 11: 248-259.

Bouckaert, R., P. Lemey, et al. (2012). "Mapping the origins and expansion of the Indo-European language family." Science 337: 957-960.

Bromham, L., R. Lanfear, et al. (2012). "Reconstructing past species assemblages reveals the changing patterns and drivers of extinction through time." Proceedings of the Royal Society B.

Comas, L., K. Mueller, et al. (2012). "Evolutionary patterns and biogeochemical significance of angiosperm root traits." International Journal of Plant Science 173(6): 584-595.

Drenovsky, R., B. Grewell, et al. (2012). "A functional trait perspective on plant invasion: invasiveness to impacts in a changing world." Annals of Botany 110(1): 141-153.

Groover, A. and M. Dosmann (2012). "The importance of living botanical collections for plant biology and the "next generation" of evo-devo research." Frontiers in Plant Evolution and Development 3(1-5).

Groover, A. and S. Jansson (2012). Comparative and evolutionary genomics of forest trees. Challenges and opportunities for the world's forests in the 21st century. T. Fenning. Scotland, UK.

Harnik, P., H. Lotze, et al. (2012). "Extinctions in ancient and modern seas." Trends in Ecology and Evolution.

Ledon- Rettig, C., C. Richards, et al. (2012). "Epigenetics for behavioral ecologists." Behavioral Ecology In press.

Lens, A., L. Cooper, et al. (2012). "An extension of the plant ontology project supporting wood anatomy and development research." IAWA Journal 33(2): 113-117.

Liberles, D., S. Teichmann, et al. (2012). "The interface of protein structure, protein biophysics, and molecular evolution." Protein Sci. 21(6): 769-785.

McClain, C., A. Allen, et al. (2012). "The energetics of life on the deep sea floor." PNAS.

Medina, I. and C. Francis (2012). "Environmental variability and acoustic signals: a multilevel approach in songbirds." Biology Letters.

Richards, C., A. Schrey, et al. (2012). "Invasion of diverse habitats by few Japanese knotweed genotypes is correlated with high epigenetic differentiation." Ecology Letters 15: 1016-1025.

Richards, C., K. Verhoeven, et al. (2012). Evolutionary significance of epigenetic variation. Plant Genome Diversity. J. Wendel, Springer.

Samuels, J., J. Meachen, et al. (2012). "Postcranial morphology and the locomotor habits of living and extinct carnivorans." Journal of Morphology In press.

Schmidt, J., N. Piekarski, et al. (2012). "Cranial muscles in amphibians: development, novelties and the role of cranial neural crest cells." Journal of Anatomy.

Schrey, A. and C. Richards (2012). "Within-genotype epigenetic variation enables broad niche width in a flower living yeast." Molecular Ecology: 2559-2561.

Schrey, A., C. Richards, et al. (2012). "The role of epigenetics in evolution: the extended synthesis." Genetics Research International.

Soltis, P. and D. Soltis, Eds. (2012). Polyploidy and Genome Evolution. Heidelberg, Springer.

Stearns, S. (2012). "Evolutionary medicine: its scope, interest and potential." Proceedings of the Royal Society B.

Stoltzfus, A., B. O'Meara, et al. (2012). "Sharing and re-use of phylogenetic trees (and associated data) to facilitate synthesis." BMC Research Notes. In press.

Urano, D., J. Jones, et al. (2012). "G protein activation without a GEF in the plant kingdom." PLoS Genetics 8(6): e1002756.

Uyeda, J., T. Hansen, et al. (2011). "The million-year wait for macroevolutionary bursts." Proceedings of the National Academy of Sciences 108: 15908-15913.

COMINGS AND GOINGS

We were delighted to have a stellar group of researchers in residence at NESCent this summer. We wish those who will be leaving the best of luck in their next adventure, and look forward to bright things from those who remain. ***From L to R:*** *Pinar Yoldas of Duke University, Martin Burd of Monash University in Australia, Matt Pennell of the University of Idaho, Kristin Lamm of North Carolina State University, Josh Martin of NESCent, Elizabeth Sbrocco of NESCent, Sarah Zehr of NESCent, Jenny Xiang of. North Carolina State University.* ***Not shown:*** *Beux (Elizabeth) Berkeley of James Madison University, Robin Bulleri of Carrboro High School, Aaron Dubrow of the Texas Advanced Computing Center, Rob Lanfear of Australian National University, Jonathon Marcot of the University of Illinois, Roy Plotnick of the University of Illinois.*

LANGUAGE, continued

ancestral "proto-language" first came to be has long been controversial.

There are two competing theories for the origin of the Indo-European language family.

According to one theory, the first Indo-European speakers were semi-nomadic horsemen who migrated out of their homeland some 6,000 years ago in what is now the southern Russian steppes above the Caspian and Black Seas. As groups of speakers become separated, their ways of speaking drifted apart.

According to a rival theory, the Indo-European language family began to spread some 2,000 to 3,500 years earlier in the Anatolian region in present-day Turkey, thanks in part to the spread of agriculture.

To test these two hypotheses, a team led by Quentin Atkinson of the University of Auckland in New Zealand used disease-mapping methods to reconstruct the expansion of Indo-European languages through time.

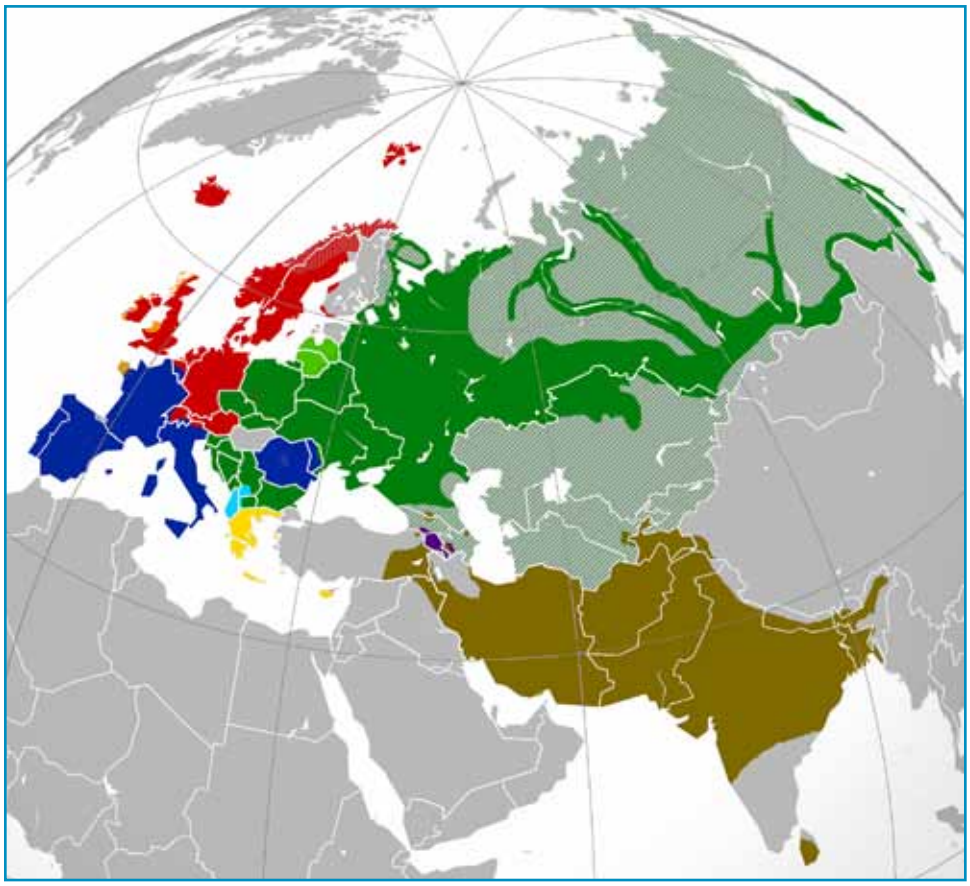
"Instead of comparing viruses, we compare languages, and instead of DNA, we looked for shared cognates, or words that have a common origin, such as mother in English and madre in Spanish," Atkinson said in an audio interview released by *Science Magazine*.

The researchers analyzed 207 basic vocabulary words across 103 Indo-European languages, including 20 that are no longer spoken.

Some of the ancient languages, such as Hittite, were spoken more than 3,000 years ago — a fact which helped the researchers look further back in time.

Historical events such as the breakup of the Roman Empire helped the researchers pin down dates for other events in the language family's spread, such as the evolution of Latin into the Romance languages.

The team used the shared cognates and other information to infer a language family tree.



This map shows the present-day distribution of the Indo-European languages.

When they combined this tree with information about where the languages are spoken today (or were spoken in the case of the ancient languages), they were able to track the movement of the Indo-European languages back in time, in the same way that epidemiologists trace a viral outbreak to its source.

The most likely birthplace of the language family, the researchers found, was a farming region in present-day Turkey, some 8,000 to 9,500 years ago.

"That doesn't mean agriculture explains all language expansion — far from it. But it seems to be a good explanation in this case," Atkinson said.

Whether computational-modeling approaches will become mainstream in linguistics remains to be seen. But in the meantime the team's next step is to look at languages in other parts of the world.

"We're looking at Australasia and Central America and trying to see what the languages can tell us about history there," Atkinson added. ●

Co-authors of the study include NESCent working group members Alexei Drummond, Michael Dunn, Russell Gray, Philippe Lemey and Mark Suchard. Read more about their working group, "Modeling the diversification of human languages," at http://bit.ly/Tj5nUP.

Learn more about what they did, and find answers to frequently asked questions, at http://language.cs.auckland.ac.nz/.

CITATION: Bouckaert, R., P. Lemey, et al. (2012). "Mapping the origins and expansion of the Indo-European language family." Science 337: 957-960. http://dx.doi.org/10.1126/science.1219669