

1. [Tropical forest carbon balance in a warmer world: a critical review spanning microbial- to ecosystem-scale processes](#)

ผู้แต่ง: Wood, T. E., Cavaleri, M. A. and Reed, S. C.

วารสาร: Biological Reviews, 2012, Volume 87, Issue 4, pages 912–927

**สาระสังเขป:** Tropical forests play a major role in regulating global carbon (C) fluxes and stocks, and even small changes to C cycling in this productive biome could dramatically affect atmospheric carbon dioxide (CO<sub>2</sub>) concentrations. Temperature is expected to increase over all land surfaces in the future, yet we have a surprisingly poor understanding of how tropical forests will respond to this significant climatic change. Here we present a contemporary synthesis of the existing data and what they suggest about how tropical forests will respond to increasing temperatures. Our goals were to: (i) determine whether there is enough evidence to support the conclusion that increased temperature will affect tropical forest C balance; (ii) if there is sufficient evidence, determine what direction this effect will take; and, (iii) establish what steps should be taken to resolve the uncertainties surrounding tropical forest responses to increasing temperatures. We approach these questions from a mass-balance perspective and therefore focus primarily on the effects of temperature on inputs and outputs of C, spanning microbial- to ecosystem-scale responses. We found that, while there is the strong potential for temperature to affect processes related to C cycling and storage in tropical forests, a notable lack of data combined with the physical, biological and chemical diversity of the forests themselves make it difficult to resolve this issue with certainty. We suggest a variety of experimental approaches that could help elucidate how tropical forests will respond to warming, including large-scale *in situ* manipulation experiments, longer term field experiments, the incorporation of a range of scales in the investigation of warming effects (both spatial and temporal), as well as the inclusion of a diversity of tropical forest sites. Finally, we highlight areas of tropical forest research where notably few data are available, including temperature effects on: nutrient cycling, heterotrophic *versus* autotrophic respiration, thermal acclimation *versus* substrate limitation of plant and microbial communities, below-ground C allocation, species composition (plant and microbial), and the hydraulic architecture of roots. Whether or not tropical forests will become a source or a sink of C in a warmer world remains highly uncertain. Given the importance of these ecosystems to the global C budget, resolving this uncertainty is a primary research priority.

2. [Genetic explorations of recent human metabolic adaptations: hypotheses and evidence](#)

ผู้แต่ง: Brown, E. A.

วารสาร: Biological Reviews, 2012, Volume 87, Issue 4, pages 838–855

**สาระสังเขป:** Since humans and chimpanzees split from a common ancestor over 6 million years ago, human metabolism has changed dramatically. This change includes adaptations to a high-quality diet, the evolution of an energetically expensive brain, dramatic increases in endurance abilities, and capacity for energy storage in white adipose tissue. Human metabolism continues to evolve in modern human populations in response to local environmental and cultural selective forces. Understanding the nature of these selective forces and the physiological responses during human evolution is a compelling challenge for evolutionary biologists. The complex genetic architecture surrounding metabolic phenotypes indicates that selection probably altered allelic frequencies across many loci in populations experiencing adaptive metabolic change to fit their environment. A recent analysis supports this hypothesis, finding that classic selective sweeps at single loci were rare during the past 250 000 years of human evolution. Detection of selective signatures at multiple loci, as well as exploration of physiological adaptation to environment in humans, will require cross-disciplinary collaboration, including the incorporation of

biological pathway analysis. This review explores the Thrifty Genotype Hypothesis, high-altitude adaptation, cold-resistance adaptation, and genetic evidence surrounding these proposed metabolic adaptations in an attempt to clarify current challenges and avenues for future progress.

### [3. On the function of placental corticotropin-releasing hormone: a role in maternal-fetal conflicts over blood glucose concentrations](#)

**ผู้แต่ง:** Gangestad, S. W., Caldwell Hooper, A. E. and Eaton, M. A.

**วารสาร:** Biological Reviews, 2012, Volume 87, Issue 4, pages 856–873

**สาระสังเขป:** Throughout the second and third trimesters, the human placenta (and the placenta in other anthropoid primates) produces substantial quantities of corticotropin-releasing hormone (placental CRH), most of which is secreted into the maternal bloodstream. During pregnancy, CRH concentrations rise over 1000-fold. The advantages that led selection to favour placental CRH production and secretion are not yet fully understood. Placental CRH stimulates the production of maternal adrenocorticotropin hormone (ACTH) and cortisol, leading to substantial increases in maternal serum cortisol levels during the third trimester. These effects are puzzling in light of widespread theory that cortisol has harmful effects on the fetus. The maternal hypothalamic-pituitary-adrenal (HPA) axis becomes less sensitive to cortisol during pregnancy, purportedly to protect the fetus from cortisol exposure. Researchers, then, have often looked for beneficial effects of placental CRH that involve receptors outside the HPA system, such as the uterine myometrium (e.g. the placental clock hypothesis). An alternative view is proposed here: the beneficial effect of placental CRH to the fetus lies in the fact that it does stimulate the production of cortisol, which, in turn, leads to greater concentrations of glucose in the maternal bloodstream available for fetal consumption. In this view, maternal HPA insensitivity to placental CRH likely reflects counter-adaptation, as the optimal rate of cortisol production for the fetus exceeds that for the mother. Evidence pertaining to this proposal is reviewed.

### [4. Physical methods for genetic plant transformation](#)

**ผู้แต่ง:** Ana Leonor Rivera, Miguel Gómez-Lim, Francisco Fernández, Achim M. Loske

**วารสาร:** Physics of Life Reviews, 2012, Volume 9, Issue 3, Pages 308–345

**สาระสังเขป:** Production of transgenic plants is a routine process for many crop species. Transgenes are introduced into plants to confer novel traits such as improved nutritional qualities, tolerance to pollutants, resistance to pathogens and for studies of plant metabolism. Nowadays, it is possible to insert genes from plants evolutionary distant from the host plant, as well as from fungi, viruses, bacteria and even animals. Genetic transformation requires penetration of the transgene through the plant cell wall, facilitated by biological or physical methods. The objective of this article is to review the state of the art of the physical methods used for genetic plant transformation and to describe the basic physics behind them.

### [5. Permian polar forests: deciduousness and environmental variation](#)

**ผู้แต่ง:** Gulbranson, E. L., Isbell, J. L., Taylor, E. L., Ryberg, P. E., Taylor, T. N. and Flaig, P. P.

**วารสาร:** Geobiology, 2012, Volume 10, Issue 6, pages 479–495

**สาระสังเขป:** Forests are expected to expand into northern polar latitudes in the next century. However, the impact of forests at high latitudes on climate and terrestrial biogeochemical cycling is poorly understood because such forests cannot be studied in the modern. This study presents forestry and geochemical analyses of three *in situ* fossil forests from Late Permian strata of Antarctica, which grew at polar latitudes. Stem size measurements and stump spacing measurements indicate significant

differences in forest density and canopy structure that are related to the local depositional setting. For forests closest to fluvial systems, tree density appears to decrease as the forests mature, which is the opposite trend of self-thinning observed in modern forests. We speculate that a combination of tree mortality and high disturbance created low-density mature forests without understory vegetation near Late Permian river systems. Stable carbon isotopes measured from permineralized wood in these forests demonstrate two important points: (i) recently developed techniques of high-resolution carbon isotope studies of wood and mummified wood can be applied to permineralized wood, for which much of the original organic matter has been lost and (ii) that the fossil trees maintained a deciduous habit at polar latitudes during the Late Permian. The combination of paleobotanical, sedimentologic, and paleoecology techniques provides an unrivaled examination of the function of polar forests in deep time; and the carbon isotope geochemistry supplements this work with subannual records of carbon fixation that allows for the quantitative analysis of deciduous versus evergreen habits and environmental parameters, for example, relative humidity.

#### 6. [Mathematical studies on the sterile insect technique for the Chikungunya disease and \*Aedes albopictus\*](#)

ผู้แต่ง: Y. Dumont, J. M. Tchuente

วารสาร: Journal of Mathematical Biology, 2012, Volume 65, Issue 5, pp 809-854

**สาระสังเขป:** Chikungunya is an arthropod-borne disease caused by the Asian tiger mosquito, *Aedes albopictus*. It can be an important burden to public health and a great cause of morbidity and, sometimes, mortality. Understanding if and when disease control measures should be taken is key to curtail its spread. Dumont and Chiroleu (Math Biosc Eng 7(2):315–348, 2010) showed that the use of chemical control tools such as adulticide and larvicide, and mechanical control, which consists of reducing the breeding sites, would have been useful to control the explosive 2006 epidemic in Réunion Island. Despite this, chemical control tools cannot be of long-time use, because they can induce mosquito resistance, and are detrimental to the biodiversity. It is therefore necessary to develop and test new control tools that are more sustainable, with the same efficacy (if possible). Mathematical models of sterile insect technique (SIT) to prevent, reduce, eliminate or stop an epidemic of Chikungunya are formulated and analysed. In particular, we propose a new model that considers pulsed periodic releases, which leads to a hybrid dynamical system. This pulsed SIT model is coupled with the human population at different epidemiological states in order to assess its efficacy. Numerical simulations for the pulsed SIT, using an appropriate numerical scheme are provided. Analytical and numerical results indicate that pulsed SIT with small and frequent releases can be an alternative to chemical control tools, but only if it is used or applied early after the beginning of the epidemic or as a preventive tool.

#### 7. [A finite-element model for healing of cutaneous wounds combining contraction, angiogenesis and closure](#)

ผู้แต่ง: F. J. Vermolen, E. Javierre

วารสาร: Journal of Mathematical Biology, 2012, Volume 65, Issue 5, pp 967-996

**สาระสังเขป:** A simplified finite-element model for wound healing is proposed. The model takes into account the sequential steps of dermal regeneration, wound contraction, angiogenesis and wound closure. An innovation in the present study is the combination of the aforementioned partially overlapping processes, which can be used to deliver novel insights into the process of wound healing, such as geometry related influences, as well as the influence of coupling between the various existing subprocesses on the actual healing behavior. The model confirms the clinical observation that epidermal closure proceeds by a crawling and climbing mechanism at the early stages, and by a stratification process in layers parallel to the

skin surface at the later stages. The local epidermal oxygen content may play an important role here. The model can also be used to investigate the influence of local injection of hormones that stimulate partial processes occurring during wound healing. These insights can be used to improve wound healing treatments.

#### 8. [Population persistence under advection–diffusion in river networks](#)

**ผู้แต่ง:** Jorge M. Ramirez

**วารสาร:** Journal of Mathematical Biology, 2012, Volume 65, Issue 5, pp 919-942

**สาระสังเขป:** An integro-differential equation on a tree graph is used to model the time evolution and spatial distribution of a population of organisms in a river network. Individual organisms become mobile at a constant rate, and disperse according to an advection–diffusion process with coefficients that are constant on the edges of the graph. Appropriate boundary conditions are imposed at the outlet and upstream nodes of the river network. The local rates of population growth/decay and that by which the organisms become mobile, are assumed constant in time and space. Imminent extinction of the population is understood as the situation whereby the zero solution to the integro-differential equation is stable. Lower and upper bounds for the eigenvalues of the dispersion operator, and related Sturm–Liouville problems are found. The analysis yields sufficient conditions for imminent extinction and/or persistence in terms of the values of water velocity, channel length, cross-sectional area and diffusivity throughout the river network.

#### 9. [The pupillographic sleepiness test in adults: Effect of age, gender, and time of day on pupillometric variables](#)

**ผู้แต่ง:** Eggert, T., Sauter, C., Popp, R., Zeithofer, J., Danker-Hopfe, H. and on behalf of the working group “Vigilance” of the German Society for Sleep Research and Sleep Medicine (DGSM)

**วารสาร:** American Journal of Human Biology, 2012, Volume 24, Issue 6, pages 820–828

**สาระสังเขป:**

**Objectives:**

The Pupillographic Sleepiness Test (PST) measures the level of alertness based on spontaneous oscillations in pupillary size. Reference data are available for male and female adults within the age range 20–60 years. The aim of the present multicenter study was to extend the age range for reference data from 20 to 79 years.

**Methods:**

A total of 239 healthy subjects, selected from three different centers (Berlin, Regensburg, and Vienna), were administered the PST. Data were analyzed with respect to possible effects of age, gender, and time of day on the pupillary unrest index (PUI) and the pupil diameter (PD).

**Results:**

Reliable data were available in 85.8% of the entire study sample and in 82.4% of elderly subjects (60+ years). Age-related changes were identified for the PUI and PD. There was no effect of gender on pupillometric variables as revealed by univariate analysis. The PD was found to be smaller in the afternoon compared with the morning. However, if subjects aged 60+ years were excluded from the analyses, the age-related changes disappeared and a time-of-day effect regarding the PUI became apparent.

**Conclusions:**

PUI and PD were found to decrease with increasing age. In addition, the present data show that nonreliable PST data occur more frequently in the elderly probably because of dry eyes, inadequate testing conditions, and technical resolution limitations.

Thus, the PST results obtained here from elderly subjects are limited and have to be interpreted with caution. Additional research on elderly specific assessment tools is needed.

10. [New insights into scaling of fat-free mass to height across children and adults](#)

ผู้แต่ง: Wang, Z., Zhang, J., Ying, Z. and Heymsfield, S. B.

วารสาร: American Journal of Human Biology, 2012, Volume 24, Issue 5, pages 648–653

**สาระสังเขป:**

Objective:

Forbes expressed fat-free mass (FFM, in kg) as the cube of height (H, in m):  $FFM = 10.3 \times H^3$ . Our objective is to examine the potential influence of gender and population ancestry on the association between FFM and height.

Methods:

This is a cross-sectional analysis involving an existing dataset of 279 healthy subjects (155 males and 124 females) with age 5–59 years and body mass index (BMI) 14–28 kg/m<sup>2</sup>. FFM was measured by a four-component model as the criterion.

Results:

Nonlinear regression models were fitted:  $FFM = 10.8 \times H^{2.95}$  for the males and  $FFM = 10.1 \times H^{2.90}$  for the females. The 95% confidence intervals for the exponential coefficients were (2.83, 3.07) for the males and (2.72, 3.08) for the females, both containing hypothesized value 3.0. Population ancestry adjustment was considered in the H-FFM model. The coefficient of the H-FFM model for male Asians is smaller than that for male Caucasians ( $P = 0.006$ ), while there is no statistically significant difference among African-Americans, Caucasians and Hispanics: 10.6 for the males (10.1 for Asians, 10.8 for African-Americans, 10.7 for Caucasians and 10.4 for Hispanics) and 9.6 for the females (9.3 for Asians, 9.8 for African-Americans, 9.6 for Caucasians and 9.5 for Hispanics). Age adjustment was unnecessary for the coefficient of the H-FFM model.

Conclusion:

Height is the most important factor contributing to the magnitude of FFM across most of the lifespan, though both gender and ancestry effects are significant in the H-FFM model. The proposed H-FFM model can be further used to develop a mechanistic model to explain why population ancestry, gender and age influence the associations between BMI and %Fat.