CONSERVATION

Wind blown

One strategy for animal conservation is to create strips of habitat that allow individuals from isolated populations to travel long distances and so meet. Damschen *et al.* report in *Proceedings of the National Academy of Sciences* that habitat corridors can also affect seed dispersal by wind (E. I. Damschen *et al. Proc. Natl Acad. Sci. USA* http://dx.doi.org/10.1073/pnas.1308968111; 2014).

From models and studies of open areas in a forest, the authors find that prevailing winds veer towards the long axis of each corridor, accelerating within corridors and strengthening at the downwind ends, and that increased turbulence creates 'hotspots' of seed uplift.

These combined effects aid seed dispersal, especially in areas connected by corridors that align with prevailing winds. The researchers argue that their findings should be considered when planning conservation efforts for plants that depend on open habitats. **Andrew Mitchinson**

LARRY MILLER/SPL

FUNDAMENTAL CONSTANTS

The teamwork of precision

A new value for the atomic mass of the electron is a link in a chain of measurements that will enable a test of the standard model of particle physics with better than part-per-trillion precision. **See Letter p.467**

EDMUND G. MYERS

One of the most amazing triumphs of modern physics is the agreement, at nearly the part-per-trillion level, between theory[1] and an experiment[2], which uses a single electron confined by electric and magnetic fields in a device called a Penning trap, for the magnetic moment of the electron. Assuming the correctness of the theoretical calculations and experimental measurements, any difference between the two could indicate physics beyond the standard model of particle physics[3]. Because the theoretical prediction requires as input an independent value for the fundamental physical constant known as the fine-structure constant, and one method for obtaining the fine-structure constant requires a value for the atomic mass of the electron (the ratio of the mass of the electron to the mass of an atom of carbon-12), the atomic mass of the electron is an essential ingredient in the above comparison. For this reason, a new measurement of the atomic mass of the electron, which has an uncertainty reduced by a factor of 13 compared with previous results[4], as reported by Sturm *et al.*[5] on page 467 of this issue, could have an impact on fundamental physics.

For the magnetic moment of the electron, both the theory and experiment actually produce results in units of the Bohr magneton, the fundamental quantum unit of magnetic moment, and so the comparison is between two dimensionless numbers. The dominant contribution to the theoretical value for the electron's magnetic moment is obtained from quantum electrodynamics (QED), the archetypical quantum field theory. This contribution is expressed as a power series in the fine-structure constant (α), which can be thought of as the dimensionless parameter quantifying the strength of the electromagnetic interaction, and which has the approximate value 1/137.

The latest QED results for the coefficients in this series, which is now complete up to $(\alpha/\pi)^5$, have required the monumental evaluation of thousands of complex tenth-order Feynman diagrams, with computers doing the underlying algebra and code generation, as well as the final numerical calculation. Including the small contributions due to the strong and weak interactions, the uncertainty in the theoretical calculation[1] is now estimated to be below 0.08 parts per trillion (p.p.t.). But, of course, because the theoretical result depends on α (except for the first term of the power series, which is 1 and is the pre-QED result obtained by physicist Paul Dirac in the 1920s), to make a comparison with the experiment, α must be determined experimentally. At present, the uncertainty in α increases the uncertainty of the theoretical prediction by a factor of ten. This limits the precision of the comparison with the experiment[2], which has an uncertainty of 0.28 p.p.t., to close to 1 p.p.t.

If all we wanted was the most precise value for α, we could simply equate theory and the experiment for the electron's magnetic moment and solve for α. But to test the theory we need a value for α that is independent of the electron's magnetic moment. Currently, the most precise approach for obtaining such a value is the photon-recoil method. This technique is based on the equation $\alpha^2 = (2R_\infty/c)\,(h/m_e)$, where R_∞ is another fundamental constant, the Rydberg constant; h is Planck's constant; c is the speed of light; and m_e is the mass of the electron.

The Rydberg constant has been determined to an accuracy of 5 p.p.t., easily good enough here, by precision laser spectroscopy of atomic hydrogen[4]. Knowing R_∞, α would follow if only