largest carbon sink (~40%) in the wild-type strain when it is grown in the same conditions. Unfortunately, the increase in lipid production observed in this knockout mutant was offset by a sizeable reduction in net biomass yield (photosynthetic activity) compared with the wild type, which rendered this knockout line commercially non-viable.

To overcome the problem of reduced biomass, the authors instead attenuated the expression of the transcriptional regulator either using RNA interference (RNAi) or by introducing targeted insertions in untranslated regulatory regions of the gene encoding ZnCys with CRISPR–Cas9. Both strategies produced mutant lines that had near-wild-type carbon assimilation rates, but partitioned more of the fixed carbon to energy-dense lipids, and less of the fixed carbon to protein compared with the wild-type strain. Remarkably, one of the RNAi lines, which reduced the level of ZnCys transcripts to ~10% of those measured in the wild type, accumulated twice as much lipid as the parental strain while retaining near-parental rates of biomass accumulation. This line synthesizes ~5 $g/m^2/d$ of lipid under nutrient-replete culturing conditions using simulated solar light.

Although homologous recombination and low-efficiency CRISPR–Cas9 editing in this algal genus had already been reported[4,8,9], the CRISPR–Cas9 pipeline presented by Ajjawi *et al.*[3] is the most impressive demonstration to date of high-efficiency, large-scale, targeted genome editing in a biotechnologically relevant strain of algae. The availability of the genome-engineering lines produced by these authors[3] should enable rapid progress in improving *Nannochloropsis* spp. for a large range of biotechnological applications.

The human population recently passed 7.5 billion people and the United Nation's Population Division estimates that the global population will be ~11 billion people before the end of this century. As we strive to find sustainable solutions to the energy and food challenges that will face a growing population in a resource-limited world, exploiting the potential of the vast salt-water habitat could prove to be transformative. *Nannochloropsis* species that can thrive in salt water may therefore become important not only for production of lipids that can be converted into biofuels, but also through use as human calories and essential nutrients for animal and aquaculture feed[10]. Improving lipid yields and controlling carbon partitioning are important steps toward the realization of the biotechnological potential of marine algae.

The mechanism(s) underlying the striking oil production reported by Ajjawi *et al.*[3] is not completely delineated, albeit the authors have evidence that downregulation of ZnCys does not alter the expression of FAS or components of the TAG synthesis pathway. Instead, it seems that downregulation of genes involved in nitrogen assimilation alters carbon flux and redirects it from pathways leading to protein synthesis into lipid storage pathways (**Fig. 1**). A precise understanding of the mechanism(s) underlying boosted oil production will be needed to enable further rational improvements in productivity.

Although the production of ~5 $g/m^2/d$ of lipid described in the paper is impressive for a pilot study, it remains far below what is required for a commercial algal-lipid-based biofuel process. Modeling of lipid yields needed to make commercialization of algal-lipid biofuels feasible indicate that in excess of 30 $g/m^2/d$ of biomass is required[1,2]. Given the rapid pace of progress in the *Nannochloropsis* field over the past decade, it seems likely that we can now redefine what is feasible in algal biotech.

COMPETING FINANCIAL INTERESTS
The author declares no competing financial interests.

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