

A solution on paper

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Weizmann Institute scientist develops a process that one day may yield a solution to the global wastepaper glut

One wouldn't expect paper to be a major source of pollution: after all, it's made from wood, which in nature breaks down into tiny components that re-enter the plant growth cycle. Yet without proper dampness and other conditions that are often missing in garbage dumps, paper fails to decompose for dozens of years. As a result, billions of tons of wastepaper cram the planet's landfills, creating an enormous environmental problem worldwide.

Prof. Edward Bayer of the Weizmann Institute's Biological Chemistry Department has developed a process that one day may yield a solution to the global wastepaper glut. Back in 1983, he and Prof. Raphael Lamed of Tel Aviv University discovered the cellulosome, a molecular complex that degrades cellulose, a major component of wood, cotton and other types of plant matter. In subsequent years, Bayer and Lamed elucidated the cellulosome's architecture and identified its major components.

The cellulosome is normally not good at breaking down man-made cellulose products such as paper, but Bayer and his colleagues are now developing "designer" cellulosomes that can improve on nature. Using genetic engineering and combining different structural elements in a Lego-like design, the scientists are putting together artificial cellulosomes that are unusually effective.

One such synthetic cellulosome owes its mastery to the fact that it's

made of enzymes with complementary modes of action. In a laboratory dish, this cellulosome takes only about a day to turn finely chopped paper, made of insoluble cellulose chains of up to 10,000 sugar units in length, into a syrup of soluble sugars. The method, reported recently in the Journal of Biological Chemistry, is far from being ready for use in actual landfills, but it points toward a promising approach to waste management: decreasing pollution while producing useful materials.

Source: American Committee for the Weizmann Institute of Science

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