



# YALE NATIONAL INITIATIVE

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Curriculum Units by Fellows of the National Initiative  
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## **Confronting the Plastic Wasteland through Engineering**

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It's difficult to imagine a world without plastic. The easy manipulation to produce desired characteristics, and not to mention low cost, of this synthetic polymer makes it a necessity for our everyday lives. We use plastics in our packaging, clothes, electronics, household products, medical devices and so much more. With such versatility, comes one of our amounting environmental concerns: plastic waste. The production rate of petroleum-based plastics has skyrocketed since the 1950s, and the plastic waste we generate annually is outstanding. Due to its low degradability, petroleum-based plastics can last for hundreds to thousands of years in the environment affecting ecosystems in harmful ways. Within this unit, there are three overarching goals to be achieved. First, it aims to address the basic chemistry of plastics exploring the basic chemical synthesis of polymers through student investigations. Second, students will analyze the life cycle of petroleum-based plastics, which will reveal the challenges of plastic waste. Third, students will consider the future of plastics utilizing their newly acquired knowledge of current petroleum-based plastic production and disposal. They will address the need for more sustainable practices in synthesizing plastics by designing, creating and testing their very own bio-based, biodegradable plastic or repurposing petroleum-based plastic in another form. Ultimately, these three objectives will be met by the content of the unit, which will expose students to the engineering design process as well as the three dimensions of the Next Generation Science Standards.

(Developed for Science, grade 8; recommended for Science, grades 6-8)

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