

## On the subject of the environmental problem of plastic pollution of our oceans.

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Plastic pollution of our oceans is becoming an increasingly urgent problem, with the weight of plastic pollution in the oceans predicted soon to outweigh that of the fish present [1]. One publication from 2012 estimated that there were approximately 165 million tons of plastic pollution in the world's oceans, with approximately 9 million tons being added each year [2]. Indeed, plastic pollution is thought to be the major threat to marine life. However, the pollution is also a significant human health problem as toxic chemicals from and absorbed by the plastic as well as the plastic itself ends up on our dinner plates, when plastic particles and fragments are ingested by fish [3,4].

Interestingly, most of the plastic pollution of the oceans is easily preventable as 90% is estimated to be due to discards from fishing and merchant vessels, while only 10% is thought to be from land based sources (Importantly, there is large local variation for these numbers) [2]. Thus, one initial approach to prevent plastic pollution is for international law to prohibit the custom of discarding plastic (and other) waste at sea, potentially with the introduction of a logbook for waste disposals, and with some kind of financial incentive (for example, reduced harbor fees). Similarly, fishermen could be required to bring ashore any plastic they get in their nets, again potentially with a flat fee incentive.

Approximately 50% of plastic waste discarded have densities lower than water and will float. Due to the low density this plastic will be taken by ocean currents, and can at some regions with vortexes called gyras accumulate in large "garbage islands" [4,5]. Such gyras are thought to contain up to 100 million tons of debris. Importantly, a project called "The Ocean Cleanup Project" is in progress that is building devices that can passively skim these vortexes for plastic, for its subsequent removal [6]. One of these passive systems is predicted to be able to remove half of the plastic in one of these gyras in 10 years.

However, ocean currents are also likely to deposit the floating plastic on the beaches, and the breaking surf could be one major factor in the breakdown of the plastic to smaller fragments. Thus, one additional important approach to clean the oceans from plastic would be its removal from the beaches, preferably before the degradation occurs. Here, robots that are similar to the robot lawn movers and vacuum cleaners sold for households could play a very important role. Such robots, preferably powered by solar panels and/or wind turbines, could be built so they are able to collect both small and large plastic fragments efficiently, while moving coordinated along the beaches; a task that is otherwise insurmountable for humans. Indeed, all the technological knowledge for building such robots is available, and with a coordinate effort the construction process could be done fairly quickly to start addressing this pressing environmental problem.

### References

1. The Ellen Macarthur Foundation.
2. Knight GD. Plastic Pollution. Heinemann Library. 2012.
3. Hammer J, Kraak MH, Parsons JR. Plastics in the marine environment: the dark side of a modern gift. *Reviews of environmental contamination and toxicology*. 2012;220:1-44.
4. Barnes DKA, Galgani F, Thompson RC, Barlaz M. Accumulation and fragmentation of plastic debris in global environments. *Philosophical Transactions of the Royal Society B: Biological Sciences*. 2009;364:1985-98.
5. United States Environmental Protection Agency. Marine Debris in the North Pacific A Summary of Existing Information and Identification of Data Gaps.
6. <https://www.theoceancleanup.com/>

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