

Entropy and Information

Consider the entropy and (mean) information of the human and the ecosystem on the Earth, the Sun, and the universe in the following steps.

Note: Expected in the estimation are not precise values but sensible arguments with consistent logic.

1. The free energy of a living human is in general much larger than that of a dead body. Explain why. Suppose that the human absorbs energy from the Earth. Show that its free energy cannot increase in this process.
2. In order to live, a human must eat some food. Show that the human can increase her/his free energy by reducing the free energy of the food, in the process of absorbing energy from the food.
3. Accordingly, what is needed is the food with large free energy, the origin of which is the photo-synthesis of plants. Estimate the maximum possible increase of the free energy of a plant in a day, as it absorbs energy from the sun.
4. Discuss the above process in terms of information transfer. Estimate the information content of a human, and discuss how it varies throughout her/his life.
5. Discuss how the information contents of the Earth and of the Sun vary.
6. Discuss how the information content of the universe evolves.