# Distinguishability, Information and Useful Energies


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As a scientist with a long-standing research interest in thermodynamics, information theory and diversity preservation, I would like to start publishing the journal Energies (ISSN 1996-1073).[...]



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*Editorial*

# Distinguishability, Information and Useful Energies

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As a scientist with a long-standing research interest in thermodynamics, information theory and diversity preservation, I would like to start publishing the journal *Energies* (ISSN 1996-1073). There are many journals dedicated to the topic of energy studies. With the work of a team of dedicated editors and carefully chosen external reviewers, publishing in paper-free Open Access online form, we will strive to set up *Energies* as an excellent and advanced forum for related science, technology and policy studies.

Not all energies are interesting. Otherwise we would not be concerned about global warming, which essentially means too much energy from the sun has been trapped on the surface of the earth. Generally speaking, human activities are all processes consuming energies to create or maintain the *distinguishability* or difference. In a hot and humid summer, the temperature and humidity difference inside and outside the building is maintained by removing energy from the room. Inside the baking oven the temperature is then higher by heating. A few meters away, in a refrigerator, again the energy is removed to have a yet colder space with a different temperature. Energy is used to maintain all kinds of difference: pressure, concentration, brightness, height, distance, to mention but a few. A large part of energy is spent to move people and goods from one location to a different location.

In this context I would like to comment that modern life also requires sometimes unnecessarily very rapid creation of distinguishability by adding or removing energies. For instance, a microwave oven is used to heat things up very rapidly (to my knowledge there is still no technology to remove energy or to cool down so quickly; obviously it is always easier to rapidly add material or energy to a system than to remove them). In the classical Chinese novel *Journey to the West* and still even when I was a child, people most of the time travelled on foot or riding on horseback and enjoyed the journey, sightseeing on the way. Nowadays, we fly in aircraft. The desire for exceeding rapidness consumes unnecessarily tremendous amounts of energy. To save fuels by slowing down might be a good topic related to energy policy studies.

Useful energies themselves rely on the difference also. Many years ago, I completed my Ph.D. thesis at ETH Zürich on the topic of methanogenic bacteria chemistry. Methane can be used as one of the fuels on earth where oxygen is the main component of the atmosphere. However, on a planet with atmosphere full of methane, if we still like to produce the “greenhouse gas” $CO_2$ there also, oxgen would be an ideal fuel. There is a difference in the so-called chemical potential before and after the

combustion reaction. Difference or distinguishability is what we want. The water levels inside and outside of a dam are no difference, the hydropower station cannot supply energy.

Good insulation (for example, thermal isolation) material for buildings can better maintain the distinguishability. For example, windows can be a significant source of heat transfer to reduce the temperature differences. Insulated glazing can significantly reduce heat transfer by radiation, conduction, or convection and can be better to keep a temperature difference.

I have proposed that in the context of information theory, *information* is defined as the amount of compressed data [1]. The paper with information recorded as a text or as a picture has difference on the parts. A blank paper with no difference on the parts of the paper has no information — the amount of date is compressed to zero, similar to the equilibrium where information all turns to *entropy* [2]. Because energy consuming processes are driven by entropy increase to the maximum till the equilibrium (a structure of indistinguishability or no difference) and entropy has been putatively understood as the information loss, we may claim that we are actually consuming information.

We are in the age of highly developed information technology. The IT aspects of energy use should be fully explored to save mineral fuels. For example, a computer connected to a network of sensors [3] to collect data and the information (differences at different times and locations) can be used to control the valves to create and maintain the distinguishability and exhaustively use renewable energy sources. In cold winters, the coolant valve can be opened to connect the refrigerator and an outdoors heat exchanger directly. In hot summer, energy can be removed from a high heat capacity fluid during the night and the cool fluid can be used to cool down the room during the hot day. Another tank can store fluid heated up during the sunny day which can be used to supply warm water. Solar energy will be harvested with the highest power if a photovoltaic cell is always adjusted in the correct direction controlled by a computer because the sun is in different positions at different time during the day. I am sure energy science and technology experts already have many good ideas like what I have. In addition to hardware (including instruments and machines), papers on new software research and development related to energy use will also be published.

Enjoy publishing in *Energies*!

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**Reference and Notes**

1. Lin, S.-K. Gibbs Paradox and the Concepts of Information, Symmetry, Similarity and Their Relationship. *Entropy* **2008**, *10*, 1-5. DOI: 10.3390/entropy-e10010001. arXiv:0803.2571.
2. MDPI also publishes another journal *Entropy* at http://www.mdpi.org/entropy/. Highly theoretical or works of a philosophical nature can be published in *Entropy*.
3. MDPI publishes *Sensors* at http://www.mdpi.org/sensors/.