

Lights and Shadows of Science and Technology in Today's Society

Richard R. Ernst, ETH Zürich, Switzerland

I was asked to add a few grains of pepper to the dinner menu by some remarks on the *Lights and Shadows of Science and Technology in Today's Society*. - Science and technology are neither bright nor dark, neither good nor evil. They function merely as tools; and tools are neutral, capable to all kinds of use and misuse.

Obviously, to discuss lights and shadows, we must address the goals and intents for which the tools are used. In my opinion, there is just one relevant goal, namely to serve today's as well as tomorrow's society by all available means. Winning prizes, becoming famous, becoming rich, and having a good life as our bankers in spacious land houses are no respectable goals for science and technology; in contrary, they might even be indicative for excessive selfishness and misuse of societal resources. Fortunately, the infamous bonus disease did not yet infect science.

Being researchers, we should not ask primarily for freedom of research. Instead, we should prove by the choice of relevant problems our willingness for behaving responsibly towards society. When we serve those who need moral, scientific, or technological support, a feeling of personal liberty and freedom of mind will follow spontaneously. John D. Rockefeller, Jr. once said: *"I believe that every right implies a responsibility; every opportunity, an obligation; and every possession, a duty."*

Please remember that research is first of all a means of education, a means of acquiring knowledge. Research is by far the best way of "learning by doing", the best way of experiencing nature by posing incisive questions and answering them by experiments. A well equipped laboratory is infinitely more useful for efficient learning than a fancy lecturing hall. We should never separate research and education! Stand-alone research institutes without educational obligations are for me a luxurious waste of resources.

Research can be driven by pure curiosity; but more often, it is from the beginning application-oriented, with a clear goal in mind, trying to satisfy a public need. And as a side-effect, it might even be serving industry. - To use my personal example, I never considered myself being a true scientist but rather an engineer, who made Nuclear Magnetic Resonance to work in a wide variety of exceedingly useful applications. Usefulness was my goal from the beginning and to the very end of my career as a researcher. - NMR and MRI succeeded without much sales promotion; their utility was so plainly obvious. We all know, sales promotion is indispensable merely for selling unnecessary products that better would never had been produced at all. In fact, the promotion of useless gadgets complicates our daily life without any benefit, degrading us to slaves of technology. Examples are plentiful; just watch our children's hypes!

Instead of sales promotion, society urgently needs continuing education by providing reliable information, receiving advises for reducing consumption, preserving resources for future generations, and saving our precious time for a life rich in content instead of becoming rich in distraction and idling nonsense. Public teaching is indeed a most important obligation of academic institutions for opening public eyes

towards potential future catastrophes, such as global warming, plundering of resources, and overpopulation.

How can we teach responsible behavior to the public as long as fraud is still a recurring fact at our universities? The excuse that even researchers are human beings does not help in this situation. Honesty in research and education is more important than all the conveyed specialized knowledge. Much more emphasis than in the past should to be put on aspects of honesty and responsibility in university education.

But as long as scientists are driven by competition, by alluring prizes, by the request of long list of publications, and by insane university ranking agencies, no hope is insight. In fact, the academic situation is just a reflection of the prevalent capitalistic free market business model that has last year failed to all extent and lead to a catastrophe on the financial market that required remedies by the otherwise ridiculed Nation States. Personal gain and egotism dominate today our short-sighted business model, following the well-known and, in fact, utterly immoral quotes by Adam Smith. The "invisible hand" and the stabilizing negative feedback loop of free market economy, unfortunately, are inoperative on a global scale and for longer time spans. - Instead of copying within our academic institutions and think-tanks this irresponsible behavior, it would be more urgent to develop new business models and models of behavior based on foresight, ethical principles, and sustainability that lead to what I often call a "responsible market economy" instead of a "free market economy".

Certainly, without science and technology, mankind has no future; but with science and technology alone, we will shuffle our own grave for ending prematurely a senseless life as robotic operators. For replenishing our life with meaning and with sense, we need, in addition, very personal passions outside of science and technology; we need a "second leg". We need *wisdom* for comprehending the dangers lurking along the future pathway, and *compassion* for relating to our, possibly needy, compatriots and for establishing long-lasting human relations.

Remember, science and technology are just tools, as mentioned at the beginning. Their proper usage requires foresight and responsibility, in the sense of the philosopher Hans Jonas who formulated the "Imperative Responsibility": "*Act so that the consequences of your actions are compatible with the permanence of genuine human life on Earth.*" Clearly, his saying boils down to ultimate sustainability. Indeed, sustainability forces us to assume responsibility for the fate of our descendants. Let us act invariably as if a sorrowful solicitor of future generations would look over our left shoulder! For example, when we consume too much meat or when we are driving our fuel-wasting SUVs.

And for those of you who feel great from time to time, and I hope all of you do, Winston Churchill once remarked: "*Responsibility is the price of greatness.*"

Thank you for your kind attention to my Sunday evening sermon!