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A. Sakharov and Fusion Research[1]

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In the landmark paper by Tamm and Sakharov [1], a controlled nuclear fusion reactor based on an axisymmetric magnetic confinement configuration whose principles remain valid to this day, was proposed. In the light of present understanding of plasma physics the virtues (e.g. that of considering the D-D reaction) and the shortcomings of this paper are pointed out. In fact, relatively recent results of theoretical plasma physics (e.g. discovery of the so called second stability region) and advances in high field magnet technology have made it possible to identify the parameters of meaningful experiments capable of exploring D-D and D-^{3}He burn conditions. At the same time an experimental program (IGNIR) has been undertaken through a (funded) collaboration between Italy and Russia to investigate D-T plasmas close to ignition conditions based on an advanced high field toroidal confinement configuration. A. Sakharov envisioned a bolder approach to fusion research than that advocated by some of his contemporaries. The time taken to design and decide to fabricate the first experiment capable of reaching ignition conditions is due in part to the problem of gaining an adequate understanding the expected physics of fusion burning plasmas. However, most of the relevant financial effort has gone in the pursuit of slow and indirect enterprises complying with the "playing it safe" tendencies of large organizations or motivated by the purpose to develop technologies or maintain a high level of expertise in plasma physics to the expected benefit of other kinds of endeavors. The creativity demonstrated by A. Sakharov in dealing with civil rights and disarmament issues is needed, while maintaining our concerns for energy and the environment on a global scale, to orient the funding for fusion research toward a direct and well based scientific effort on concepts for which a variety of developments can be envisioned. These can span from uncovering new physics relevant, for instance, to high energy astrophysics to the feasibility of new neutron sources.

[1] A. Sakharov, Collected Scientific Works (Publ. Marcel Dekkes, Inc., New York, N.Y., 1982).

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