

poses (§ 500) might yield a more suggestive text, expressing more accurately the real meanings of a problem and its proposed solution. Suppose we dictated the second of the above conundrums (§ 580) into a robot instructed to translate it into German and the particularly regular Esperanto, including all possible alternative meanings. The machine would type out: *Was hat 4 Räder und (fliegt) (Fliegen)?* and in Esperanto *Kio havas 4 radojn kaj (flugas) (muŝojn)?* And there you perceive the answer to the conundrum. Similarly the robot chess player can beat any ordinary player, because it thinks of so many possibilities. Or suppose we called for the first conundrum to be translated into French—its last clause would come out: *mais (le grand Indien) (la grande Indienne) n'est pas le père du petit Indien*. Again you perceive the solution, which your habit-trammeled mind had missed. Only a nonhuman device can think of every possibility, immune to every habitual association, and make unprecedented connections, as well as the old and habitual linkages which have been thought of and found inapt.⁵³² Arnold cites cases where such mechanization has helped invention.⁵⁴⁶

[584] A newly devised way to get cooperation between the two "separate sides to my head" is "brainstorming," devised and taught especially by Osborn.⁵⁴⁷ The two sides are to work not simultaneously, lest imagination be repressed by criticism; but first the ignorant, free-wheeling fancy is to have its fling; only at later sessions is any criticism allowed. For extra stimulation for the first phase a group of 5-12 equals is assembled, given a problem, and asked to think up many solutions for it; these are tossed about among the group, for improvement and addition, with laughter perhaps, and no word of criticism then allowed. A maximum number of suggestions are sought, which will be recorded anonymously and later graded for merit, but still with weight given to *quantity* of good ones. Instruction is also given on the various poisons to creativity, and the steps to be followed, and standard checklists (§ 592) are used to stimulate ideas and their fullest development. Everything said is recorded, and the ideas later codified, studied, evaluated, recirculated, and occasionally worked up and adopted. A followup for later occurring ideas may be useful. When used as a training exercise a question might be: What else could you do with a coat hanger? To avoid repressive memories of authority and custom, Arnold⁵⁴⁸ when at MIT even postulated a certain other world, where conditions would be highly different, but not scientific principles; thus the students should have less fear of offering a "wrong" or foolish proposal.

[585] Brainstorming has won considerable vogue of late, in various big corporations, schools for military officers, Government laboratories, and for general students in the University of Buffalo, as a means of encouraging originality and thinking up betterments in fields of invention, business management, merchandising, and collegiate education; and there are striking tales of its success. But it has seldom been seriously applied to highly scientific matter such as Chemistry, where rare knowledge is all-important, and peer groups hard to assemble. It may be useful in those *milieus* where employed.⁵⁴⁹ But we have found little evidence that for solving baffling problems in scientific fields it has any more of lasting, carryover value than the same number of student- and leader-hours spent on more conventional efforts.⁵⁴⁹