THE TALK OF THE TOWN

Notes and Comment

FOR months, we've been uneasily eying a subway advertisement that pictures a complicated-looking electrical unit and inquires, rather belligerently, "When this circuit learns your job, what are you going to do?" Now, we know that the advocates of skill-retraining aren't trying to scare *us*, nor have any strange new machines moved into our office lately, but we *have* been wondering just how rampant automation is likely to become. For one thing, philosophical-minded friends have taken to spoiling parties for us by arguing over when the activity of a machine may legitimately be called "thinking." (They all assume, of course, that sooner or later science will build robots whose behavior will be indistinguishable from human behavior.) We've taken only small comfort from humanistic debaters who hold that, however smart a mechanical brain may become, it will never be capable of man's most sophisticated acts of mind, such as creative abstraction, moral choice, and falling in love. For even if machines can't achieve "consciousness" in the human sense, it's discomfiting to think of them grinding away at the very gates of our highest capacities. Wrestling with these lofty conceptual problems, our friends have apparently not thought to ask how well a digital computer (the only high-speed all-purpose information-processing device in existence) can manifest the simplest kinds of intelligent behavior. It stands to reason that before any mélange of wires and tubes occupies our desk and sends us scurrying off to "retrain for tomorrow's jobs" (whatever they may be) it will have mastered at least the rudimentary intellectual activity characteristic of children and, in some cases, animals—playing games, recognizing patterns, solving easy problems, reading sentences. With the help of the press, a few noisy researchers in the field of artificial intelligence have fostered the impression that such modest feats can indeed be performed by machines today. A wellspring of this scientific mythology seems to be a historic talk delivered in 1957 by H. A. Simon, one of the grandfathers of artificial intelligence. "It is not my aim to surprise or shock you—if, indeed, that were possible in an age of nuclear fission and prospective interplanetary travel," Mr. Simon said. "But the simplest way I can summarize is to say that there are now in the world machines that think, that learn, and that create. Moreover, their ability to do these things is going to increase rapidly until—in a visible future—the range of problems they can handle will be coextensive with the range to which the human mind has been applied." Mr. Simon went on to predict that within ten years a digital computer would (a) win the chess championship of the world (unless barred, by rule, from competition), (b) discover and prove an important new mathematical theorem, (c) write music praised by critics, and (d) programmatically express most theories in psychology.

Well, we've just come across a lovely paper by Hubert L. Dreyfus, a professor at the Massachusetts Institute of Technology, which says computers can't, and won't. With Mr. Simon's

decade almost up, we learn, a recurrent pattern has plagued artificial intelligence in every field it tackles: dramatic early success followed by unforeseen problems and then by disenchantment. In game playing, for instance, researchers developed a checkers program, about ten years ago, that was able to beat an ex-champion from Connecticut. In chess, however, where the number of possible moves and responses is so much greater, computer programs bogged down in the problem of exponential growth. A computer's attention cannot be attracted by areas on the board that look interesting. It cannot zero in on possibilities that appeal to a sort of "fringe consciousness." It can only count out alternative moves on an ever-branching tree of possibilities. At about the time of Mr. Simon's grand prognostication, a group at Los Alamos devised a chess program that played an inferior, though legal, game on a reduced board. Ever since that program beat one weak opponent, the forecasts of impending master play have grown increasingly emphatic, but no computer developed in the intervening years has failed to play a stupid game. A highly publicized program, in its latest recorded bout, was defeated in thirty-five moves by a ten-year-old novice. Yet the projected world championship is only a year off. The quest for a new mathematical theorem has a similar history. An ingenuous reader of W. R. Ashby, a leading authority in the field of computers and thought, might assume that Mr. Simon's prophecy about the important new theorem has already been realized. Professor Ashby recently hailed a particular program's powers: "Gelernter's theorem-proving program that discovered a new proof of the *pons asinorum* that demands no construction"—a proof which "the greatest mathematicians of 2000 years have failed to notice" and which "would have evoked the highest praise had it occurred." A glance at D. E. Smith's "History of Mathematics" (published