Real and Imaginary

by "Vector"

ELECTRONICS: THE ROAD AHEAD?

Guglielmo Marconi, I see, once asked "Have I done the world good or have I added a menace?" Now, that's what I call a jackpot question. Perhaps, with his vision, he saw what was coming to us, like Wonderful Radio One; in which case it wasn't any wonder that the poor chap got depressed.

I'm not really changing the subject, but did you read about those recent experiments at Yale University? If you didn't, the set-up, briefly, was that a volunteer citizen was set down in front of an impressive switchboard and a row of 30 switches labelled from 15V to 450V in progressive steps. The object of the exercise, he was told, was to see whether electric shocks would prove to be an aid to learning, and he was to be the "teacher". Another subject, "the learner", was strapped into a kind of electric chair: the idea was that he should be asked questions; if he answered incorrectly it was the teacher's job to operate the first switch and administer a mild shock. Further incorrectly-answered questions called for progressively increasing shocks; the "teacher" had first to call out the applied voltage and then dish it out, right up to the 450V maximum. Just to show him what it was all about, he was given a sample shock from the third switch. The whole operation was in the charge of a stern-faced laboratory man with an authoritative manner.

As if you haven't guessed, the whole thing was a "con", with the teacher as the guinea-pig. The victim in the chair was an actor who got no shocks whatsoever but simulated an appropriate reaction whenever he (intentionally) gave a wrong answer. These reflexes graduated from slight twitches through to grunts, agonized screams, appeals to stop, pleadings of a heart condition, on to a final stage of incoherence and frenzied drumming of his feet. Whenever the "teacher" showed signs of wanting to give up, the experimenter in charge told him firmly, but without threats, that he must carry on.

Forty people, chosen at random over a cross-section of the social structure, participated. Of these, no fewer than twenty-six completed the exercise right through to the final "450V", inflicting, (as they believed) considerable suffering. Sixty-five per cent.

Not hand-picked sadists; just ordinary human beings. I don't know how you react to this but it quietly scares the pants off me.

Are we, I wonder, losing our capacity for compassion because of over-familiarization with suffering at second hand? At almost any hour of the day or night the turn of a switch permits a retreat into an escapist world—and, by and large, a violent world it is, too. After an hour or so of a gangster film it becomes difficult to appreciate that those bodies lying in a Belfast gutter aren't actors too.

In warfare, also, electronics is steadily divorcing us from reality. Aerial dog fights are in the museum; no longer is the victor confronted with the horror of an aircraft plunging earthwards with its crew roasting alive. Miles away from hostile object an order is given, a button is pressed and a target-homing missile is on its way. A symbol disappears from a radar screen and that's that. Its the difference between having to go into a slaughterhouse and hack a chunk of meat from an animal corpse and strolling into a supermarket and selecting a nicely-packaged chop. And who's morally responsible? The designer of the electronics weaponry? Those who built it? The chap who gave the order? The one who pressed the button? Or who? The text-books don't tell us, neither do the technical journals. And yet, the fundamental importance of electronics, as Marconi foresaw, lies not in the challenge of devising clever-clever circuitry but in its impact on human nature and relationships.

I hope I'm wrong, but the way electronics is developing could be conditioning us towards acceptance of a computer controlled society. After all, shorn of their emotive content, the problems which consistently baffle Harold, Ted and Co. become elementary arithmetic to a super number-cruncher. How to make the UK self-supporting? Simple. With a population of around 60 million and a comfortable self-sufficiency for only 10 million, a computer's amoral and unsentimental memory-banks would merely order the extermination of everybody over the age of 50 and all those unable or unwilling to work. And that's just for starters. Population-stability could be achieved by introducing Pill-like ingredients into all food, with permits issued to selected breeding pairs enabling them to obtain non-contraceptive foodstuff for a requisite period. The realization of the materialist millenium needs only the applied logic of a computer.

The last time we met, if you remember, the subject under discussion was the crisis over the impending famine of raw materials. If you don't altogether fancy the computer recipe for salvation (and at least all readers over the half-century mark will be agin it, I fancy), there are fortunately other ways in which electronics could help to stave off disaster.

For instance, we could re-deploy the world's research effort into tapping a virtually inexhaustible source of energy which is at present largely going to waste. I

mean, of course, the sun. The whole of the earth's supplies of coal and oil were laid down by the equivalent of three days of sunlight. What's the sense in scrabbling dangerously for second-hand sunlight when we could get our power supplies by direct down-conversion from the 1.3kW per square metre which is the mean rate at which solar energy falls on the earth's surface?

As "Cathode Ray" reminded us in the Feb. 1961 issue of WW there are at least three main ways of doing this. One is by magnetohydrodynamics (MHD), in which a conducting fluid or plasma cuts a magnetic field. In this application, sun-energy could probably be used to heat the plasma; thus, the approach would eliminate fossil fuel, steam boiler, turbine and the rotary aspect of the alternator. Another approach is by thermionic generation. In this a cathode is heated non-electrically (sun-energy?) to a high temperature, boiling off electrons which reach an anode and create a voltage between it and the cathode. The third method is by thermo-electric generation, in which a current is produced when one of the junctions between two dissimilar metals is heated.

There are other means as well. Solar energy systems for heating or cooling houses and commercial buildings are now coming into use—a new addition to the RCA Building in New York is a recent case in point. Solar voltaic cells could, by intelligently-planned mass production, be fabricated very cheaply and the coverage of a hundred square miles or so of presently-useless Sahara Desert could provide the power requirements of Europe and Africa.

Neither is direct sunlight our only bet. The sun generates high-velocity winds, and chains of wind-driven rotors of advanced design could provide much useful power. Tides and thunderstorms have been neglected as energy sources. The earth itself is a vast reservoir of heat for direct conversion and in many places it's virtually on the surface. Hot spring areas and volcanoes provide immense power sources.

With direct-conversion systems, present efficiencies are not good, but not so bad as you might think, so that's where concentrated research would pay off. particularly in semiconductor areas. Just as a multi-stage turbine extracts as much energy as possible from steam, so too might MHD, thermionic and thermoelectric "engines" be combined into a highly-efficient three-stage generator, with the waste heat from the first fed into the second and then the third. And, after all, the overall coal-to-electricity efficiency of a large, modern power station is only about 32% anyway.

But we shall probably go along the same old tram-tracks, taking orders and the line of least resistance simultaneously; in that event, Guglielmo Marconi's premonition will be justified. The Science Museum has called his centenary exhibition "A Girdle Round About the Earth". Perhaps if Marconi could see the road we've taken since his time he might want it amended to "My Girdle's Killing Me".