judgments by more than one examiner, and (*c*) automatic data processing of these complex records.

We might, now, consider the implication of these studies for improving our ability to detect deception with the polygraph assuming, for this purpose, that adequate transducers and methods of measurement exist or can be devised. Although activity of the autonomic nervous system may be observed in many ways, the addition of new measures would not necessarily increase the accuracy of detecting deception. The value of additional measures depends upon the way in which deception affects various physiological processes. Assuming that the three present indicators do not adequately sample the physiological expressions of deception, it would make sense to add new response measures which fill this gap. Our knowledge on this point is slight. An estimate that the polygraph-and-examiner has a high accuracy (e.g., about 90 percent) does not provide an estimate of the variance due to each of the three polygraph responses alone or in combination or to the examiner. Therefore, we do not know whether there is room for improvement in the instrument or in the responses which are measured.

Current technology permits us to examine the value of observing the three current response mechanisms as well as the possible value of adding new ones. The essential device which has not been available previously is automatic data processing equipment. Ellson (1952, pp. 150–161) proposes that several indicators should be combined by means of discriminant functions to provide a more powerful indicator but points out that our ability to improve detection of deception will be limited by the reliability of the individual measures. The use of a computer to combine these variables for lie detection has been suggested by Zimmer (1961) who has assembled equipment for such an experiment but no results are available as yet. The work of Ax, Lacey, and Wenger, mentioned above, could readily be extended into the area of lie detection.

The many autonomic responses which may be added to lie detection are listed earlier in this report but they must be chosen so that only the more diagnostic ones are used. The three variables in current use will probably remain highly useful. Promising ones to consider are blood volume in finger, muscle tension, skin temperature, eye motion and electroencephalograph, the last if additional research clarifies the meaning of the phase changes. Initial studies involving multiple sensors would have to be accomplished in a laboratory setting with possible cumbersome equipment. However, great advances have been made recently in improving sensors and in reducing their size for use in hospitals, medical experimentation and the bioastronautics program and there is no reason to doubt that the necessary equipment can be made more convenient to use. This applies also to reduction in the size of any computing equipment that might be developed to perform on-line data processing of physiological indications but further speculation in this direction is premature. It is clear that the patterning of physiological responses in lie detection is an area in which additional research can be accomplished readily by taking advantage of existing techniques which have not, as yet, been applied to lie detection.

7. Current Research on Lie Detection

An organized research program to improve lie detection does not exist at the present time in the Government though scattered support, at the rate of about $100,000 per year, may be identified. Within this small budget, more funds are devoted to the improvement of equipment than to basic or applied research. Some topics enjoy interest but no financial support. Finally, we will note briefly the existence of useful work in related areas.

A. GOVERNMENT-SUPPORTED RESEARCH

Government-supported research on lie detection is directed primarily toward improving existing instrumentation and developing a few sensors and transducers. A small effort is directed toward developing new procedures. The following listing is believed to represent the entire effort:

(*1*) *Miniaturized polygraph*

A prototype, transistorized polygraph weighing about 10 pounds will soon be available for evaluation. (Associated Research, Inc., already markets a 21-pound polygraph instrument which operates on four flashlight batteries and fits in an attaché case. C. H. Stoelting Co. has developed a 12-pound instrument which operates on 110-volt a.c. current.) Current "portable" equipment weighs up to 40 pounds.