We were interested to hear Dr. Lehmer (University of California, Berkeley) say in his welcoming address that he felt the recent rapid development in the computer field resulted in part from free access to information developed by U.S. Government-sponsored projects. However, now that more of the development work is being done commercially, company security is beginning to restrict information and level off the rate of development. A second factor which Dr. Lehmer believes is slowing up development in the computer field is that many good mathematicians find coding and computing a narrow field that doesn't continue to hold their interest.

Although there are undoubtedly very real handicaps, we have not noticed any leveling off. There was certainly no indication of it in the talks or the exhibits at the Conference.

If there is a leveling off we believe that there are other important causes, as was suggested by Mr. McDowell (International Business Machines Corp.) in his keynote address. He agreed with Dr. Huntoon's remark last year—"You ain't seen nothing yet!"—and went on to point out the vast possibilities for computer control of industrial processes and business systems. One obstacle to more widespread application of computers to those fields, Mr. McDowell said, is that the machine is expected to work under existing rules which were set up for people, not machines. Perhaps we should change our processes and procedures. Radical thinking, with process, management, and computing engineers...

1More about this "company security" later when we discuss the need for a "Council" for the industrial process control field.

2This is interesting in the light of Dr. Huntoon's remarks expressed at the Western Computer Conference a year ago, that if computers are to survive they should adapt themselves to their human environment.
working together, will be necessary, and new concepts are needed. Why not apply the systems analysis technique which has been used so successfully for the development of new weapons?

Dr. Wooldridge (Ramo-Wooldridge Corp.) seemed to agree with this general idea in his luncheon address. He predicted that the next few years will see sufficient progress in systems analysis to allow the use of computers for the solution of industrial and business problems which are now beyond their capabilities.

Later in his talk Dr. Wooldridge presented one of the most intriguing thoughts of the Conference. He pointed out that if sufficient information were available on demand and fairly inexpensively, many business reports now thought essential would become unnecessary. Oh, happy day!

* * * * *

All of the papers presented at the Conference were either concerned with completely digital equipment or with analog-to-digital converting equipment designed to allow digital computers to solve problems usually thought of as more effectively handled by analog means.

Of twenty-three exhibitors four, Beckman, Boeing, Electronic Associates, and William Miller, showed analog computers; but among the large companies, notable by their absence, were Goodyear and Reeves.

Do these things indicate a trend? Is the analog computer on the way out? We don't believe so. The analog computer definitely has its place. But we have kicked that one around in these pages before. The important point is that there is now a wide area in which either analog or digital means may be employed to advantage. As digital machines get faster and analog machines get more accurate, this area becomes larger and larger. So unless the analog people show more interest in developing new areas of application, as the digital companies are doing, the analog market will probably grow - but gradually - while the digitals get the lion's share of the new business.

That is, unless the whole picture is upset by new developments. And there are indications that this might happen. A paper by Bernard M. Gordon (Laboratory for Electronics, Inc.) on "Application of Operational Digital Techniques to Industrial Control" and one by Loren P. Leissner (U.S. Naval Ordnance Laboratory, Corona) on a "Real-Time Digital Differential Analyzer" suggest how it might happen.

Our readers will recall that the Newsletter has been advocating and predicting some kind of complementary combination of the inherent advantages of analog and digital techniques and equipment ever since it has been in existence. The papers mentioned, plus some confidential information, indicate that this may happen sooner than we expected. In fact, we will stick our neck out and predict that such a computer will be exhibited and be commercially available at next year's Western Computer Conference.

Overheard at the Conference

"Some people say these things are getting almost human. I dunno, but the first time I hear of one asking for a mate I'm through!"
How Wide Is Our Interest?

Friday morning, 12 February 1954, Sibyl M. Rock (Consolidated Engineering Corporation, Pasadena, Calif.) presided over a discussion group sponsored by the Western Computer Conference. The announced subject was "Numerical Control of Petroleum and Chemical Processes". But in spite of the conniving of the digital interests indicated by that "Numerical", the group refused to be so encumbered. The discussion became much more general and the word "analog" was even used now and then, though of course only the better-informed understood.

William Karmak (Fluor Corp., Ltd., Los Angeles, Calif.), Harry Brough (Shell Chemical Co., Torrance, Calif.), and Henry Neubols (Beckman Instrument Co., Pasadena, Calif.) opened the discussion with talks and then served as a panel during the discussion period.

We cannot report the discussion in detail, but we were impressed by some facts which were brought out:

1. The application of automatic computers and computer techniques to industrial process control opens a field of staggering possibilities.

2. The talent required to develop these possibilities most effectively cuts across company and professional lines. Real progress demands the cooperation of competitive interests within the process industries, and of management and operating personnel within the companies.

3. That's a big order. Some think it is impossible because "company security" might be violated. We are not so pessimistic. We in the Simulation Council have benefited from the exchange of information on equipment and techniques developed in connection with matters under strict Security Classification, without violating our country's security.

4. Something like the Simulation Council for the process control industries is way overdue. A coordinated attack on the problems of better control through the proper application of established and understood computer techniques could produce almost immediate, though not final, results. Later, longer range and substantially greater benefits would be gained through the association of users and designers of equipment (as they have in the case of the Simulation Council).

So what to do about it? It would seem that more than 20 people thought the answer was obvious. At Sibyl's suggestion they signed up as being interested in getting together again to see what can be done. We would like to help.

We believe in general that technical progress, by producing better things at lower cost, improves the standard of living for all of us. And we believe in particular that advancing the art of automatic computation will benefit all of us who earn our bread (and/or beer) in that field.

So—o—o— your Chairman, your Secretary, and your Editor have agreed that we should lend a helping hand to this infant now so he may be won't beat hell out of us when he grows up. We propose that with the help of Jack Walker*

*Jack doesn't know this yet!
The Simulation Council's Visit to the Consolidated Engineering Corporation Plant

In our last Newsletter we described the carryings-on in our discussion session at Consolidated Engineering Corporation on 24 January. Following this we visited our host's main plant in the Hastings Ranch area of Pasadena. At this facility the company produces mass spectrometers. These spectrometers provide the data which make it possible to analyze complex chemical mixtures by means of computation. Galvanometers, oscillographs, and components for analytical and data-reduction equipment are also produced at this plant, as are leak detectors and titrilegs.

The leak detectors are essentially special-purpose mass spectrometers which can detect minute amounts of helium. To find leaks in vacuum equipment, the detector is connected to the evacuated system and small amounts of helium are successively applied to points on the outside at which leaks might occur. When the leak detector detects helium you have found your leak. When used to detect leaks in pressure, a small amount of helium is introduced into the pressure system, and a "sniffer" connected to the leak detector is passed around the outside where leaks might occur. One model of the detector is capable of detecting a leak amounting to one thinnelful of helium in 31 years.

We next visited the plant occupied by the Transducer Division and the Data-Processing Group, some miles from the main plant. At this site sensitive pickups are produced for the recording of strains, vibrations, pressures, voltages, etc., as well as analog-to-digital conversion equipment for data-reduction systems. One converter, the SADIC, samples at the rate of once per second, whereas the MilliSADIC samples at the rate of once per millisecond.

We went from this plant to the nearby Computer Division, which had a prototype model of the 203 General Purpose Digital Computer in operation. After a photoelectric tape reader puts information into the computer at the rate of 450 decimal digits per second, the computation rate is based on an ability to perform 500 additions per second. Numbers and instructions are drawn from a quick-access memory, and the output we saw was a Flexowriter. Punched card input and output and magnetic tape auxiliary storage are also available. This particular computer had been in operation for several months for applications studies. Six production computers are now being manufactured for customers at a little over 100 kilobucks per copy.

The Franklin Institute Computer Facility

Some time ago we were happy to receive a letter from L. P. Tabor, Associate Director of the Franklin Institute Laboratories for Research and Development. We found Mr. Tabor's comments of such interest that we asked him to write something about his facility for the benefit of our readers. His reply follows (in part).
"The Franklin Institute Laboratories for Research and Development, one of the major departments of The Franklin Institute, have a staff of approximately 270 technical personnel, working in the fields of Electrical Engineering, Mechanical Engineering, Chemistry and Physics and Solid State Physics.

Analysis, computation, and the design, construction and operation of computers and simulators have been substantial activities in the Electrical Engineering Division for several years.

We have designed, built, and are now operating a flight simulator for the Wright Air Development Center, the purpose of which is to obtain a mathematical "descriptive function" for pilot performance. The term "transfer function" is avoided deliberately, since it is not yet clear that one exists in this case.

At the end of this month, we expect to deliver to Aberdeen Proving Ground a special-purpose simulator for use in connection with one of their ballistic problems.

Several years ago, we developed a "Graphical Simulation" method for the study of air traffic control problems in the terminal area, and later expanded the method to cover the airport surface control problem. The graphical method is still in use as a preliminary method of selection of problems for the Dynamic Simulator at the CAA Technical Development and Evaluation Center in Indianapolis. We then formulate the selected problems for the Dynamic Simulator, and analyze the resulting data for CAA.

Beginning early in May, we will install and operate the world's largest A-C Network Calculator. It is being built to our specifications by Westinghouse, and will be used primarily for the systems problems of seven nearby utility companies, although a small amount of time is expected to be available to other companies who may require a particularly large analyzer.

About three years ago we designed and built an advanced time scale electrical analog computer for the specific purpose of analyzing and synthesizing servomechanisms. This computer has been in almost constant use ever since on a wide variety of servo and automatic control problems.

Our Analysis Section has had an unusual amount of experience in the field of statistics, and in the design of range experiments for the testing of airborne fire control equipment, including the instrumentation of the range, and reduction of test data. We are now engaged in programming an improved data reduction method for one of the large-scale digital computers."

* * * * *

We appreciate letters of this kind. They give us an idea of some of the things going on in places the Simulation Council cannot hope to visit.

We would like to hear from our other readers in far-off (i.e., outside of Southern California) lands.
More On Noise

While we are on the subject of correspondence we appreciate, we would like to quote the following letter in its entirety because of its significance with respect to a subject we have kicked around considerably and which, it seems to us, needs a great deal more castigation.

"In the November issue of the Simulation Council Newsletter I noted some discussion of the noise generator used at Goodyear Aircraft, and I thought that the following comments would be in order.

First, to discuss the appearance of the output signal. While it may be true that CR oscilloscope picture might show the output to be a series of straight lines, when recorded with a Brush recorder it just looks noisy. This is because of the amplitude distribution forced on the signal by the filter.

The amplitude distribution of the filtered noise output is theoretically Gaussian because the filter output is the sum (weighted) of many independent values of the input. In order for this to be true, the time constant of the filter must be several times greater than the average time between pulses. (That is, the weighting function must have a reasonably large value over many past pulses.) We have not as yet measured the amplitude distribution of the noise output, but we plan to do so in the future.

We have measured the power spectrum of the noise, however, by both frequency analysis and autocorrelation techniques. The spectrum obtained is that of the filter within experimental error as would be expected with white noise inputs.

Our main operational difficulty in using this noise generator has been in maintaining zero average value. Most of the drift is removed by amplifying and clipping the input square wave before the filter. Even so, there is some difficulty in measuring the absolute value of epsilon squared over long periods of time.

It should be pointed out that this noise generator was suggested to us by Jim Pollen and George Ench of the Applied Physics Laboratory of Johns Hopkins University in Silver Spring, Maryland.

I would be interested to learn of any reports available on the subject of establishing or determining the effects of manufacturing tolerances with statistical simulation techniques.

In closing, I would like to express our appreciation of the Newsletter. Although we cannot participate in the meetings, the thorough reporting you do is an excellent substitute.*

Very truly yours,

GOODYEAR AIRCRAFT CORPORATION

C. H. Reynolds
DSCL – Dept. 453
Plant C

*We couldn't resist including that plug. Thanks!
Reynolds enclosed a Brush recording of the noise generator and the low-pass filter output recorded at fast and slow paper speeds. All your Editor can say is that they sure looked noisy and they sure looked random. Guess those are the prerequisites of a good noise generator!

This overall noise problem is quite a thing. Some of those who have done the best work in the field are the first to admit that they are not even sure they have the correct approach, much less solution!

We noted that Hughes was displaying a noise generator at the Western Computer Conference, about which they have the following to say:

"The generator is designed to work into a standard analog computer amplifier having 1 megohm input resistance. The power supply is built into the unit and employs a constant-voltage-type power transformer to regulate against line voltage changes. The power requirements are 110 volts 60 cycle a-c and 110 volts 400 cycle a-c. The maximum output level is 15 volts rms, which may be decreased by a built-in attenuator. The frequency spectrum of the noise generated is uniform from zero to 35 cps. The output falls off rapidly above 40 cps. A standard panel meter filled with heavy silicone fluid monitors the output and provides a smoothing time constant of several minutes. The final output of the noise generator is Gaussian or normally distributed noise, which is the desired distribution for most uses."

Some of us who are particularly interested in the subject of noise are going to get together at Hughes the second week in March and have another go at it. This is not a Simultron Council meeting (but if anything of interest transpires your Newsletter will let you know), and attendance is to be by invitation only. However, if any readers are particularly interested, and especially if they have done some work on the problem, they can probably get invited by getting in touch with John Mandrow at Hughes Research and Development Laboratories, Culver City, California.

Want a Componder for Your Analog Monaserie?

"Waveform Duration Componder" is the descriptive (or is it?) title given to the magnetic tape analog information compressor, expander, or storage device developed at NAMCO, Point Magu, California for use in the Simulation Laboratory.

This gadget has created so much interest that Phil Jensen, who did most of the development work, is investigating the possibility of making similar equipment available commercially.

Developed primarily for noise studies, the Componder promises to be one of the most useful accessories in the Simulation Lab.

In theory it is simple. Analog information in the form of a dc voltage is converted into the ratio of the duration (as contrasted to the absolute duration) of a pulse to the duration of the time of no pulse. This ratio is of course unaffected by tape speed. So information recorded at one speed can be played back at another, either faster or slower by a ratio as high as 64 to 1 without re-recording. By re-recording any ratio is possible. And if it is desired to reproduce the information on the same time base
as it was recorded, the amplitude is unaffected by wow and flutter.

See the possibilities? We have used ours to record noise at 1/16 real time (a necessary concession to a human operator in the data reduction loop) and then introduced it into a simulation in real time. We expect to use it to:

- Slow down data for less-than-real-time simulation.
- Speed up low-frequency noise for analysis by an audio spectrum analyzer.
- Repeat noise for simulation studies.
- Generate noise continuously from a sample recorded on a continuous loop.
- Make autocorrelation studies.
- Generate arbitrary functions, especially those of long duration with respect to the frequencies present.
- Introduce time delays.
- Synchronize data time-wise by recording two or more tracks on the same tape.
- Store data.

May we interest you in one?

Commercial Analog Computer Facilities

Although it has been possible for some time to arrange for the use of certain analog equipment in Southern California, notably Tom Rogers' heterogeneous collection at UCLA and the EASE computer at Jim Rea, there is now a new facility set up for the avowed purpose of (among other things) furnishing analog computer services.

Incorporated under the name of Dynalysis, the group was formerly with the J. B. Rea Company and, now that Jim has moved to his new building on Cloverfield Boulevard, is doing business at the old J. B. Rea address (11941 Wilshire Boulevard, Los Angeles). They have a fair-sized installation of new EASE equipment which they demonstrated to their friends and prospective customers on 27 and 28 January by computing the trajectory of a ski jumper.*

Meanwhile we understand that Jim Rea plans to get a complete installation of Electronic Associates equipment and to offer similar services.

This should be interesting. We wish him both success - and believe they can both have it - If they are willing to get out and preach the gospel of analog computation and simulation to those who don't even know that such a thing exists or what it is, much less that it can solve their problems.

A Really Good Book!

We have just finished examining Floyd Nixon's new book, Principles of Automatic Controls, one of the Prentice-Hall Electrical Engineering Series. We think it is the best we have seen on the subject by a good margin. Not trusting our

*That's really reaching to get away from Security Classification!
own judgment, however, we have asked the opinion of some considerably more skilled in the art, and they concur heartily — adding some reasons we had missed.

Floyd Nixon is Senior Electro-Mechanical Engineer with the Glenn L. Martin Company of Baltimore. He has been closely connected with the design of guided missile automatic control systems, has conducted many automatic computer simulation programs, and has taught in-company classes in automatic control system design. He is also a charter member of the Simulation Council, but that is not the reason we like his book.*

We like Floyd's book because it is practical. It teaches methods and how to apply them. It is both a textbook for those who wish to learn and a handbook for those who wish to do. If you are concerned with feedback systems, this would be an excellent book to have on your desk.

The March Simulation Council Meeting

Our March meeting will be held at Convair-San Diego the afternoon of Friday, the 19th.** It will be Classified Confidential. Those not having current term clearance will have to request special clearance for this meeting through their clearing agency. Please make these requests now. If they don't get through you won't get in. We know!

All visitors should check in not later than 1300 at the lobby of the Administration Building — that 7-story building with windows on the top floor only known as The Silo — just south of Sassafras Street on Pacific Highway. Thirty minutes will be allowed for processing through security and the meeting will start at 1330.

The first speaker will describe the trials and tribulations encountered in actually setting up a real simulation problem. The second speaker will then compare this with the problems involved when the simulation is for the purpose of evaluating an existing system rather than designing a new one.

The discussion will take off from there!

*We admit being pleased, however, by Floyd's inclusion of a chapter on automatic computers.

**The change from our usual meeting day to Friday was so that those who traveled far might travel a little farther and check on what the boys in the back room across the border are having. Friday night (and perhaps Saturday!) will find many of the Simulation Council living up to that prophetic name by which we are often addressed, the "Stimulation Council". So come on down. A little tequila won't keel—ya!

SUBSCRIPTIONS TO THE NEWSLETTER

To subscribe to the Simulation Council Newsletter, send a check for $6.00 to the Simulation Council, Box 731, Camarillo, California. The six bucks cover the cost of a one-year subscription.