tortuous paths followed by past generations. They should be launched from the start on the straight road of modern mathematics.

CALGARY HIGH SCHOOL STUDENTS ATTEND A COMPUTING CONFERENCE, by B. A. Hodson

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The Calgary Computing and Data Processing Society was inaugurated in January of 1961 and the first board of directors was elected to office in May of that year. At the suggestion of the new president, [the author], it was decided to form a committee to study the possiblity of holding a conference on computing for high school students later in the year. A committee of three was formed under the chairmanship of Dr. J. E. L. Peck of the University of Alberta. The result of this committee's work was a conference held at the University of Alberta, Calgary, January 13, 1962.

Registration of students began at ten o'clock with campus students and members of the Society assisting in registering some 140 students before 10:30. Each student was given a program of the day's activity and an identification badge supplied by the Alberta Wheat Pool. Each badge was one of seven colors, a code to establish which computer installation was to be visited later in the day.

At 10:30 the students were welcomed by the president on behalf of the Computing Society and by Dr. Peck on behalf of the University. The meeting was then handed over to the chairmanship of Bill Taylor of CES Computing Centre in Calgary. Mr. Taylor explained the purpose of the conference, to make students familiar with electronic computers and also to introduce to them the possibility of a career in this rapidly expanding profession. This was followed by an address by this author entitled "Introduction to the Electronic Computer".

He explained that an electronic computer is made up of five basic elements: input units, memory, arithmetic unit, control unit, and output units. He explained how the computer works internally by means

of electronic devices akin to switches and illustrated the binary code used by many machines. The purpose of the input units was to convert the everyday language of business and science into the language of the computer. This could be done by means of paper tape, punched cards or magnetic tape. Samples of paper tape and punched cards were given to each of the students, who were also shown a reel of magnetic tape such as is used on the larger computers. The output units are to convert the internal language of the computer back into the everyday language of business and science. In addition to punched cards, magnetic and paper tape for output, there is also a high speed printing device and cathode ray display device. The memory is made up of magnetic cores and is divided into characters and words. It is used for storing instructions for the computer and also for storing the data the instructions are to work upon. The order in which the instructions are performed is under the direction of the control unit. If the instruction involves arithmetic then this is carried out in an arithmetic unit. Students were then introduced to P. Brown of Shell Oil Company who spoke on "Working and Playing with a Computer".

Mr. Brown told the gathering that computers were not intelligent in the least but rather the slaves of a group of people known as programmers. These people tell the computer by means of coded instructions exactly how the machine is to solve a particular problem. He pointed out how these instructions are stored within the memory device of the computer and how it is able to perform several thousand of these instructions every second. Examples of instructions for a particular computer were then given and with these instructions a simple computer program was illustrated. It was emphasized that before writing down these instructions it was necessary to analyze a problem in great detail, spelling out minutely how the answers would be derived from the given input. The results of this minute analysis were expressed in a detailed flow chart from which the actual machine instructions were then constructed.

After a brief recess Dr. J. E. L. Peck spoke on "Careers in Computing". In the next five years it is expected that the computing profession will employ some 375,000 persons in North America, in all categories. Dr. Peck outlined some of the job categories with the qualifications for each. He illustrated the jobs of machine operator and coders, for which a high school education alone would be sufficient. Operators press the buttons to make the computer operate whil

coders convert the detailed flow chart prepared by programmers into computer language code. Above these categories he listed programmers whose job is to prepare the detailed flow charts by which a problem would be solved on the computer. Training for this would be any general degree with mathematics and science, while not a necessity, being of advantage.

Systems analysts usually require an honors degree in some subject and will usually analyze problems for computer solution in that particular subject, although they could analyze problems in related fields. They usually outline the problem solution in sufficient detail that the work can then be carried on by a computer programmer who will prepare the detailed flow charts. The numerical analyst he listed as the cream of the computing profession. For this an honors mathematics degree is a necessity. The numerical analyst takes the various integrals, differential equations, business mode, and the like and develops numerical methods with which to solve them on the computer. In the area of electronics there is a vast field of work in computer maintenance, for which an interest in electronics but not necessarily a degree is required. Requiring an honors degree, preferably in mathematics of physics, is the field of computer design. This is the development of the logic of computers. The actual design of components and machine "hardware" requires another group of personnel specializing in electronic and electrical engineering.

During the lunch break, the computing society members mingled with the students to answer any questions that may have arisen during the morning sessions and the group reconvened at 1:15 p.m. at which time Mr. Taylor introduced D. Wehrhahn of International Business Machines Company to talk on "The Future of Computing".

At this lecture the audience heard of the development of high speed magnetic tape readers, able to read 150,000 characters per second. Document readers that read typewritten documents were mentioned with the further development of machines to read handwritten documents directly into the computer memory. Computer memory devices would become larger in the number of characters that they could store but smaller in the volume of space that they would occupy. Scientists are now working in the field of cryogenics to develop circuits that operate close to the absolute zero of temperature which can change their state is less than a billionth of a second, requiring very

little electrical power. Present machines can perform almost one million operations per second and computers under development will be even faster than this. Machines are under study that will understand the human voice, while in existence already is a machine that will talk to you.

After this final lecture students split into groups to visit computer installations in Calgary. They visited an LGP 30 at CES Computer Services, an RPC 4000 at Texaco Oil Company and at the Royal McBee Company, a 1620 at International Business Machines, an IBM 650 at Shell Oil Company, and an IBM 1410 at Imperial Oil Company. At each installation the group was shown the computer and its peripheral equipment. Demonstrations were also seen showing the computer at work and at play A questionnaire completed by the students indicated that the conference was well accepted. Many indicated that they would like to see something similar for other professions. It is hoped that this conference will become an annual event.

A SUMMER AT STANFORD, by H. F. McCall

> Editor's Note: Dr. McCall, principal of Seba Beach School, was awarded the Shell Merit Fellowship last year. We plan to include an article by him in our June issue.

The chance to be a Shell Fellow and participate in the Stanford activities of this special group of science and mathematics teachers chosen by the Shell Oil Company does not come to everyone, but it did come to me. It might come to you too if you entice Lady Luck a little, say, by showing your interest in this program and making inquiries from Shell Merit Fellowships, School of Education, Stanford University, Stanford, California.

The eight-week program at Stanford is designed specifically for the Shell Fellows, a total of about 50 science and mathematics teachers, five of whom are from Western Canada and the rest from the United States west of the Mississippi.

For part of the day all of the group were together. Then for the rest of the time we were separated into three groups - the physics, chemistry, and mathematics sections, for specialized work in those