

# R. S. R. S.

## *Newsletter*

No. 83

March 1968

### CHARLES BABBAGE 1792-1871

Charles Babbage is well-known as the inventor of an early mechanical form of computer rather like the electronic ones that we hear so much about today. In his honour we intend to call building 93 of the National Physical Laboratory the Charles Babbage Building.

He was the son of a banker who left a considerable fortune, allowing him to devote his time to a wide variety of interests besides the calculating machines. His idea for a difference engine came to him in 1812 or 1813 while he was an undergraduate but he did not begin to develop it seriously until about seven years later. This first machine, the "Difference Engine", calculated tables of values from their differences and would probably be used chiefly for interpolation. Such a mechanical aid is extremely valuable and for many years, even in Mathematics Division after 1950, people would sit at a National Cash machine pounding the keys for just this purpose. Babbage's scheme was received quite enthusiastically by the Astronomical Society and the Royal Society and he received a grant from the Government to help him build the machine. Five years later he asked for more money and this was agreed, together with the building of a new workshop near to Babbage's home.

At this point, Babbage began to run into trouble. He had a disagreement with Clement the engineer who ran the workshop. Clement dismissed the man working on Babbage's job and only after a prolonged dispute would he give up the drawings and completed parts of the engine.

Perhaps it was because of the pause in the work of construction that Babbage began to have new ideas about his engine. First he thought about

/calculating



calculating one of the higher differences from the function itself and in this way carrying out automatically a forward integration. Then he began to think about how to make a machine that would do any calculation whatever and got his inspiration for controlling it from the Jacquard loom. This had been introduced in 1801 and employed a string of punched cards which was sensed by peckers actuating the lifting cords of a loom. Such machines are still in use. Babbage saw that the cards could be used to hold numbers and also that the operations to be carried out on the numbers could be coded on the cards. In this way the idea of the Analytical Engine was born.

From this time onwards Babbage tried repeatedly to get more money from the Government, without success. He spent a lot of his own money, a good deal of design work was done and a few parts were made but very little actually put together. Unfortunately he would never keep the design stable for very long and it was probably this continual search for greater refinement that prevented the completion of the Analytical Engine.

The Difference Engine was actually built by George Scheutz, a Stockholm printer, and used in America for calculating astronomical tables. In 1863 a copy was made for the British Government for the "English Tables of Lifetimes, Annuities and Premiums".

It is odd that Babbage published no very good account of the remarkable Analytical Engine. There is little doubt that Babbage's designs were logically and mechanically sound and he invented an excellent notation for mechanical parts with which to express on the drawing the relations between the gears, racks, ratchets and so forth. A good account of Babbage's engine was written by L. F. Menabrea who had heard Babbage lecture on the machine in Turin. This paper was translated into English by the Countess of Lovelace (daughter of Lord Byron) and she added extensive footnotes which are of the greatest interest. These footnotes show a remarkable understanding of programming. She writes of using the machine to calculate with algebraic formulae in their symbolic form; she describes iterative cycles and cycles nested to any depth.

Babbage was disappointed by the lack of official help with his analytical engine. He complains about this in his writings, but in a good humoured way and appears to have remained a cheerful and very sociable character.

His autobiography "Passages from the Life of a Philosopher" is full of interesting stories and I shall quote just one. Babbage was making measurements of the motion of railway carriages and he had a special carriage fitted up with several pens inking curves on paper to record the various shakes of the carriage in motion. He was out one Sunday with an extra heavy load of 30 tons of iron on his experimental carriage, expecting it to be the only train on the line. Babbage's train had almost been put on the north line because of a supposed obstruction up the line, but at the last moment they heard the obstruction was cleared and stayed on the correct side. While he

/was

was talking to a railway official Babbage heard a distant train. This turned out to be a single engine on the north line which stopped at the engine house and Babbage ran as fast as he could to the spot. From the engine descended Brunel, covered with soot. He had gone by carriage to Bristol to meet the only train at the furthest point of the rail then opened but had missed it.

"Fortunately" he said "I found this engine with its fire up so I ordered it out and have driven it the whole way at the rate of 50 miles per hour".

Babbage's interest ranged over picking locks, punching holes in glass, fossils, volcanoes, lighthouses, and submarine navigation and his autobiography is a fascinating story.

The first conception of a universal calculating machine was produced by Charles Babbage and one of the first working machines of this type was built at the National Physical Laboratory. It is therefore very appropriate to name a building after this great Englishman.

D. W. DAVIES

(With acknowledgements to N.P.L. News in which this article recently appeared.)

#### STAFF NEWS

##### Congratulations to :

Miss Wendy Fry and Mr. W. Bryson on their marriage at St. Albans on 15th March.

Mr. C. C. R. Church on his being awarded first prize for First Year H.N.C. Applied Physics at Slough College.

##### Welcome to :

K. H. Tan	Non-Perm. Tech. Officer, Singapore
D. A. Thom	Non-Perm. Handyman, Falkland Islands

##### Resignations

A. J. M. Simpson	Estab. S.S.A., Winkfield
S. J. Hammond	Non-Perm. A.E.O.
E. M. Forsdike	Estab. S.S.A.
M. Chivers	Estab. E.O.
Mrs. B. M. Tew	Part time Senior Cook
Mrs. E. Brown	Part time Cleaner

LETTERS TO THE EDITOR

Dear Editor,

I am prompted by the sting in the tail of Mr. Bale's letter to make a few remarks about the lack of a general sense of purpose on the Station.

I doubt whether such a stimulant was necessary in the classic research laboratory situation. A high percentage of the staff would have either been initiating the work or dependant on it for a vital qualification. Such laboratories ran by a sort of spontaneous combustion process. At R.S.R.S. there is quite a large body of experimental and young scientific staff who certainly don't initiate work and whose only gain on completing a project is satisfaction that the equipment or programme worked. The part applied - part academic mixture in the Station's work emphasises the problem by encouraging superficial comparisons between working to gain an acknowledgment on a scarcely read paper or working to provide essential information for say, the communications industry. Add to this the intangible nature of the Station's output and surely the necessity for an overall sense of purpose is demonstrated.

Considerable benefits might come from improving internal communications. Few people in the lower echelons are really aware of the value placed by the scientific world on the work of the Station. For instance, I think few confident replies would be produced if the following questions were to be asked around the Station :-

Why does anyone require a more detailed knowledge of the ionosphere than has been available for some time?

If tropospheric propagation links are operating satisfactorily in many parts of the world and the Americans can even build beyond the horizon radar, why do we want to know even more about the troposphere?

If our interest in these fields is purely academic how do we limit our studies?

Why don't we utilise our fund of tropospheric knowledge to increase our national usefulness and possibly our budget by running a consulting team to collect data for and advise on the siting of specific link and satellite terminals?

Exactly how will the maps of atmospheric noise which will eventually be obtained from Aerial III be of use in planning international radio?

How are we related to international bodies like C.C.I.R., U.R.S.I. and C.O.S.P.A.R.? Who are our representatives to these bodies and what do we contribute?

Such questions must seem trivial and the answers self evident to many people but there are others for whom the lack of obvious answers is an unnecessary source of discontent.

Until the continuing job of explaining the background to the Station's programme and reporting the services done for the outside world is tackled in some way a general sense of purpose cannot exist. Only with such information can people feel that they are part of a responsible body which satisfies a genuine need.

R. J. POWELL

SPORTS AND SOCIAL CLUB

The A.G.M. of the Sports and Social Club will be held on Monday, April 29th at 5.15 p.m. in the Canteen. Refreshments will be provided beforehand.

MAD HATTER'S HOP

Despite a fairly low attendance the hop on March 1st developed into a very pleasant evening. A great deal of initiative was displayed by those who designed and made their own hats, although some found it difficult to maintain a state of equilibrium whilst dancing (or was this a consequence of the good trade done by the bar?).

The "half-a-group" turned out to be Les who played electric organ and Dave who accompanied him on drums. The music they provided was excellent and many people have expressed the hope that they appear here again.

A wholesome buffet of French bread and cheese was available to those who needed it and fortunately most did.

The hop was not over-advertised and I felt that more support was expected by those who had worked so hard to organise it.

J. A. CRAWFORD

MUSIC CLUB

It has been suggested recently that there would be some enthusiasm on the Station for a Music Club whose scope could be as wide as its members wished it to be. As a start it is hoped to form a small male voice group meeting say once a week directly after work for rehearsals. To get some idea of the potential support and to discuss future activities a meeting will be held in Room 2 at 1 p.m. on Thursday, April 4th. Anyone only faintly interested will be welcome.

E. DUNFORD

CRICKET SECTION

At an informal meeting on 22nd February the following officers were elected for the 1968 season :-

Team captain : E. Dunford  
Treasurer : M. Colbourne  
Groundsman : B. Moosajee  
Secretary : C. Boulton

A fixture list is in preparation; we already have two Sunday matches with R.G.O., Herstmonceux. Most of our matches will be of the 'knock-out' variety, played after work on Thursdays.

We are in particular need of two fast bowlers of around county standard, but in default of these we welcome anyone, the only requirement being an interest in the game! Interested people should contact one of the above and/or join in the lunch-time knock-about which should commence with the onset of warmer weather. Don't assume you're not good enough, come and join us. We are not out to build a world-beating team, merely to enjoy a game of cricket.

C.R.B.

LETTER TO THE OUTSTATIONS

Dear Colleagues,

I'm not quite clear what constitutes a battered caravanserai, but have a feeling that one has just moved on from Ditton Park. In short, the contractors' huts have disappeared; the rough places made plain and tarmac'd o'er; and the new building interiors generally tarted up to receive the bands of truth-seekers.

About those contractors' huts, though, there's something of mystery, they are with us but not of us. Their coming and going, in component parts, may be clearly seen, but when assembled they have a queer timeless look about them. A new one is never seen, neither is seen one so decrepit that it was not apparently fit for further use. In very early photographs, taken in the 1840's both here and in U.S.A., there are those huts, in just the same condition. During the Crimean War they are pictured, lurking at the back of a landing stage, hard by the unloading troopships, and doubtless they encompassed about the freshly rising Pyramids and Solomon's Temple.

Have I stumbled, all unknowing, upon a Great Truth of Masonry or is it some new aspect of relativistic physics relating to very slow moving bodies, the clock paradox, entropy and all that jazz. Anyway there's something about 'em for look how they have taken over the Letter - all I intended was a two line reference.

Now, with this new finished extension, we have a truly impressive main corridor. Viewed from the workshops end, it seems to rush away to infinity and in so doing invites experiment. Surely we should use it as a large waveguide, acoustic resonator, or something. Propagation velocities should be measured within its confines. What about non-reciprocity effects in Staff velocity to and from lunch, together with thoughts on bunching and travelling disturbances produced by the tea trolley. Such proper study of mankind might well do more than physics can to justify our ways to man - and Nature. Anyway 'twould be a bit more copy for,

Yours sincerely,

The Editor