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R.S.R.S. Newsletter

No. 62 June 1966

TOTAL ECLIPSE

On May 20 this year there was a solar eclipse in Greece during which E.S.R.O. launched seven rockets, carrying experiments designed to study the C, D & E regions of the ionosphere. R.S.R.S. was responsible for one of the experiments in five of the rockets, American 'Arcas' with Sparrow boosts. They reached heights of about 100 km, and the two other rockets, French Centaures, about 115 km. Our experiment was designed to measure the intensity of solar Lyman-alpha radiation and included two sensors, which were exposed by an ejectable belt above 60 km. The other experiments were a positive ion probe by University College, London, and Faraday rotation at three frequencies by the Ionospheric Laboratory, Copenhagen. Also aboard was a sun sensor and a slant range indicator.

The experiments were built by the laboratories concerned and integrated into the payload by Engin's Matra of Paris. The telemetry system was standard FM/FM IRIG purchased in America.

As can be imagined the administrative difficulties were enormous but the payloads left for Greece in April and the R.S.R.S. team arrived in Athens on the 4th May. We stopped overnight at a splendid hotel, were very pleasantly surprised by the bill, and left in our hired Fiat 850 for Karystos on the Island of EVVIA. EVVIA is a large island to the east of Athens joined to the mainland by a bridge at Chalkis, a small town some 110 km to the north. We arrived in Chalkis fresh, after an easy journey on a very fine road and enjoyed a leisurely lunch of lobster and retsina - a white wine strongly flavoured with wood resin. We had been told that it would take three days for us to get used to the taste but we were unprepared for the smell which was like freshly cut pine. Feeling

slightly queasy we left for Karystos down a road marked on the map as secondary, which obviously meant "one cunningly concealed pot hole every 2 km". I noticed with some apprehension that the last 50 km of the route was marked 'other roads' and were 4th category. The scenery was magnificent but we had little time for it as we concentrated on keeping the car on the road and the lobster in our stomachs. There was not much traffic, just the odd Mercedes truck on the wrong side of the road travelling at 60, occasionally a herd of goats or perhaps a villager on a donkey. Presently we hit the coast and the road was mostly half-way up a mountain with a nasty drop on my side of the car. The surface gradually became worse and in places was no better than a cart track. When we eventually arrived in Karystos we felt that we had achieved something outstanding in the field of motoring but there was no welcoming committee, no flags and no indication as to where the launching area might be. We stopped a Priest (in a Makarios hat) hoping he might speak English and pretty soon we were at the centre of a crowd of babbling Greeks who knew from our colour that we were strangers and from our actions that we wanted the rocket range. Giving us directions was another matter and in the end we went off in the direction that created least noise from the Greeks. The road was soon impossible and we turned back to Karystos. At the next attempt we found a radar truck on the outskirts inhabited by bronzed Germans who spoke a little English and told us the way to the site which seemed exactly the way we had just tried. They insisted, and off we went again. This time we persevered a little longer and although it seemed improbable that motor vehicles had ever been that way before we eventually arrived at the base. We were surprised to find a large aluminium assembly hall and a number of gaily striped tents labelled "scientifiques", "salle de reunion", "centre de controle", "hommes" etc. etc. The launching pad and blockhouses were a km away along the beach. Here again everyone was bronzed, fit, dressed in swimming costumes and completely uninterested in our arrival.

We decided to ignore them, found our box of belongings and unpacked it. Surprisingly nothing was broken and we assembled our test apparatus in the tent, now gently simmering at 85°F in the evening sun.

At about 7 p.m. everyone started back to Karystos so we grabbed a guide and started to gingerly ease our gallant Fiat over the rocks that were the road. Suddenly there was a shattering hoot and a roar as a Volkswagon minibus with some 10 Germans inside careered past and left us blind in a cloud of dust. This was quickly followed by a Peugeot which was actually trying to overtake the bus. There was a third impatient blast behind us but we had had enough of the dust and we kept sedately to the middle of the track ignoring the rumpus behind us although we did increase our speed a little. To our surprise we found that it was no worse going fast (the springs did not have time to bottom) and we were soon back in the town and being shown round the hotel. It was new - too new - and we had no hot water. Workmen were finishing the place from six in the morning onwards. We changed for

dinner, the only people on Evvia to do so, and were taken to a restaurant about the standard of Jock's cafe. There we were offered large quantities of meat, tomatoes, olives, oil and a handful (I mean handful) of chips. It was well cooked and we ate well but found the retsina difficult to swallow. After dinner we found another cafe for coffee and Greek brandy. The brandy was half the price of the coffee and if ever you are tempted to drink Greek three star brandy - don't. Insist on the fourteen star.

We hit the sack with a shattering thump - there were no springs in the bed and spent the next half hour getting rid of the mosquitos. Sleep at last until 2 a.m. when the cocks started crowing, then dozing until 4 a.m. when we jerked upright in our beds by an unearthly, shattering, continuous noise from beneath our window. On investigation this new tormentor proved to be a very small lovesick donkey calling his mate across the street. We prayed that she would not reply and relapsed until breakfast.

Feeling delicate we shaved in cold water and went to breakfast - which consisted of nescafe, black bread and peach jam. Still starving we went to work determined to do something about it when we felt a little stronger.

Everything at the site was foreign - even the mains sockets - and we struggled to get ourselves integrated although in the best tradition we insisted that everyone spoke English. After a few days the catch phrase was "belodie crazie - " and the 'IN' thing was to annoy us and pick up a new English swear word.

There was to be a test firing of each type of rocket on the 15th May and in some strange disorganised way we moved slowly towards readiness when there descended on us a public relations woman bringing with her hordes of journalists, film crews, television personages and tourists. We struggled valiantly with our final calibrations while being photographed from every angle. The launch crews armed the rockets while being questioned by cigar-smoking press-men and jostled by flashing photographers. As evening fell on a tiring day a splendid white yacht slipped into the bay and the ESRO hierarchy, with wives, were rowed ashore just in time to get things organised.

The launching was chaotic with the experimenters trying to monitor the rocket in the telemetry station which now contained all the hierarchy and their wives. We had managed to get a copy of the countdown with great difficulty but we need not have bothered, for it was changed drastically five minutes before launch. Someone had had a good idea!! However this did not daunt control who intended to launch despite anything.

"Ten, nine, eight, sept, six, emg, er, um, merde, feu, fire!" and off went the Arcas on a perfect flight.

The Americans from N.A.S.A. were also firing a prototype that day and, feeling rather smug, we received the news that their Arcas second stage had failed to ignite due to their drawing the wrong rocket from stores together

with the right instructions. The trouble with the Americans we told ourselves was that they were too well organised. The Centaure rocket also performed well although its telemetry transmitter suffered a corona discharge and much of the data was lost.

That night there were celebrations in 'Max's Bar', a night club set up by the Germans, during which some rather wild english games were played to the amusement of the others. Tragically one of our team found himself unable to support his weight on beer bottles at arms length and crashed smiling to the floor. Alas that smile will never be the same again.

The next morning we managed to get almost uncooked eggs for breakfast. We explained by means of pantomine that we wanted the frying pan held over the fire for at least ten minutes. After an age the waiter went into the kitchen with something approaching comprehension on his face and from then on our eggs were always served in individual frying pans.

The next week was pretty hectic. The only light relief was a Greek film in Greek about the rise and fall of a stripper, midday and midnight bathing, a little scorpion hunting and plenty of retsina, which by now tasted to us like lemonade.

At last everything was ready and as the sky darkened the rockets went off without too many hitches and more or less on time. Unfortunately this time there were failures with two of the Arcas rockets reaching only 10 km apogee. Of the remaining three one was completely successful, and one failed to release the belt covering the sensors of two experiments. The third gave very low readings on our experiment. Perhaps this is right as the flight was near totality but it looks suspicious.

Afterwards there was a press conference at which someone wanted to know if there was any danger from the crashed rockets fuel. No, he was assured, there was no danger as the rockets had all landed at least 60 km away in the sea. At this precise moment a reporter walked in nonchalantly carrying the payload of a crashed rocket under his arm. He had found it less than 5 km away.

The Americans had 100% success but the Centaures had more corona troubles and it would appear that little data will come from these flights.

After the press conference there was a cocktail party when we drank Ouzo, a local aperitif something like gripe water with aniseed, to which we attributed our complete freedom from tummy upsets. The E.S.R.O. bosses appeared highly delighted with the degree of success we had achieved and presented us with medals. On the medal was a picture of a French rocket speeding towards the sun and a map of Europe, which included the S.E. corner of Kent.

We rounded off the evening with a wild party ending with one of the U.C.L. team finding a barely dead octopus in his bed and everyone vowing eternal friendship throughout Europe for ever.

Next morning we slipped out of Karystos on the ferry and within two hours were on the motorway to Athens. Altogether an enjoyable but tiring three weeks.

P. Reader

100 Years of Zinc and Salammoniac

One hundred years ago on 8th June 1866, Georges Leclanché filed the patent for his primary cell. A recent commemorative article (1) rightly says that this patent covered the basic processes still used in the dry batteries which power pocket torches and transistor radios throughout the world.

After an early education in England, Leclanche returned to France to study. He graduated as a chemical engineer in 1860 and then joined one of the new railway companies. In work which was concerned with the setting up of electrical timing systems he first became aware of the faults of the primary cells available at the time.

This branch of electro-chemistry had engaged many astute minds ever since Volta's invention of the Copper-Zinc cell over half a century before. Grove, the inventor of one form of primary cell, had experimented in 1840 with his 'Gas Battery' or oxy-hydrogen fuel cell as it would now be called. In 1859 Planté had evolved the lead-acid secondary cell and by this time such workers as Bunsen, Smee and J. F. Daniel had each produced his particular answer to the disadvantages of the primary cell.

The main trouble was the so-called 'polarisation' of the positive electrode. A layer of small hydrogen bubbles formed all over the electrode's surface when current was flowing and consequently the internal resistance rose to a high value and the cell became useless. There was also a problem caused by impurities in the zinc negative electrode but this was soon overcome by amalgamating a thin layer of mercury on its surface.

The polarisation effect was the hardest nut to crack. Daniell, in his primary cell of 1836, had overcome most of the difficulties by using two electrolytes separated by a porous wall of unglazed porcelain. It was a good cell, but the two liquid idea was not popular for some applications and many attempts were made to prevent polarisation by other means.

Leclanché succeeded, after many experiments and a concentrated study of electro-chemistry, in producing the primary cell which bears his name. The positive electrode, a carbon plate, was placed in a porous pot containing manganese dioxide. The outer glass container held the only liquid required, a solution of salammoniac (ammonium chloride) and a negative electrode of zinc coated with a thin layer of mercury.

In Daniell's cell the effects of polarisation were countered by the use of the liberated hydrogen to reduce the inner liquid (Copper Sulphate) and deposit copper on the positive electrode which was already made of that metal. In the Leclanche cell it was finely divided manganese dioxide which was reduced, and it reacted with the hydrogen sufficiently rapidly to enable the cell to be used for relatively intermittent demands (ringing bells, pulse production and various signalling needs) over a very long period of time. The only need was to top up the electrolyte now and again and replace the zinc at infrequent intervals.

About 70 years ago the zinc was formed into the outer container and the liquid replaced by a moist jelly - the modern dry cell had arrived.

Such then was Leclanché's cell. It can still occasionally be found, looking much as it did a century ago, ringing bells in remote houses. The author bought one new at a local ironmongers in 1939. It cost only one and sixpence and was a splendid contraption like a sort of square glass jam jar with a circular top painted with pitch, and a curious lip to support the zinc rod. They may still be on sale somewhere, the trouble is that nowadays, you can't get the zincs, you know.

G. W. Gardiner

1. Barak, M. Electronics and Power June 1966.

Dr. W. H. Eccles F.R.S.

The death occurred, about a month ago, of Dr. W. H. Eccles. It marked the breaking of one of the last remaining links with the very early days of wireless signalling. He was appointed demonstrator at the Royal College of Science in 1894 and in 1898 had been awarded a D.Sc. for his investigations into the action of the coherer, a now almost forgotten device for detecting electromagnetic waves. At this point in his career he became associated with Marconi in the newly formed Wireless Telegraph and Signal C^{o} and he continued his work in the company's laboratories.

In the early years of this century he returned to academic life, holding increasingly important appointments as his career progressed. Later researches included a study of the crystal detector and a very interesting early paper on the ionosphere based on observations of atmospherics at twilight. Using a crystal receiver, headphones and a keen mind he considered the velocity of propagation in an ionised medium, dispersive effects therein and ion recombination rates. Uniting these thoughts with his observations he proposed a diurnal variation in layer height and noted increased daytime absorption in winter in what he generously termed 'Heavisides reflecting layer'. All this was in 1912.

Dr. Eccles was made F.R.S. in 1921 by which time, in conjunction with Jordan, he had devised the valve maintained tuning fork as a frequency standard and perhaps his best known contribution to circuitry, the Eccles - Jordan bistable dividing circuit. He held many important appointments such as President of the I.E.E., the Physical Society and the Institute of Physics, and his advice was sought in many important Government undertakings. The 16 Kc/s station at Rugby owes much to his skill.

In this age, counting and dividing circuits in the form of small semi-conductor modules are orbiting in the ionosphere.

We see an astonishing progress, yet, in a kind of way, it is an integration of the work which marked the ninety years of life of Dr. W. H. Eccles - 'The eminent authority on the coherer'.

G. W. Gardiner.

STAFF NEWS

Congratulations to:

Dr. H. Rishbeth	now	P.S.O.
Dr. E. Dunford	"	S.S.O.
Mr. E. Golton	"	S.S.O.
Mr. D. E. Smith	"	S.S.O.
Mr. D. G. Thorpe	"	S.S.O.
Mr. M. Chivers	"	E.O.
Mr. D. G. Collyer	"	E.O.
Mr. M. A. Pender	"	T./A.E.O.

Welcome to:

Mr. F. J. Williamson	T/Lab.Mech.
Mrs. E. M. Watson	T/cleaner
Mr. P. E. L. Neirinck	T/S.S.A.
Mr. P. G. Pavard	T/Lab.Mech.
Mr. J. A. Parton	A.E.O.
Mrs. D. E. Robertson	T./Personal Sec.

Resignations

Mr. P. J. Howell	A.E.O.
Mr. F. E. Graham	T./C.O.

SPORTS AND SOCIAL CLUB

SECTION REPRESENTATIVES

Bar	Peter Bradley	Old Building
	Margaret Powell	Old Building
	Ken Slater	Room 7
Badminton	Malcolm Chivers	Spur A Main Lab.
	Veronica Lovell	Spur D Room 48
Billiards	Ken Slater	Room 7
Bridge	Jean Fooks	Room 3
Camera Club Sec.	Henry Rishbeth	Hut 18
Tr.	Paul Dickinson	Spur D Room 42
Chess	Albin Zavody	Spur B Main Lab.
Concerts	Veronica Lovell	Room 48 Spur D
Cricket	Tim Bevan	Spur B Main Lab.
Darts and Shoveha'penny	Barmen	
Radio Society	Derek Thorpe	Room 38 Spur C
Smith-Rose Cup	Eric Dunford	Room 40
Sweet Shop	Janet Willsher	Library
Table Tennis	Margaret Powell	Old Building
Tennis	Richard Smith	R.R.L. Computer Group Office
Windsor Theatre	Veronica Lovell	Room 48 Spur D
Alec Brook Sports Equipment	John Juleff	Spur C Main Lab.
C.S.M.A. Membership Forms	Barbara Greenfield	Old Building
Blood Donors	Tony Lowe	Spur A Main Lab.

BAR

The bar in the old building is now open again. We have just obtained a new stock of beer and spirits and anyone wishing to partake of these will find the bar open from 1 p.m. to 1.30 p.m. each day.

K. Slater

TENNIS

Old Windsorians defeated us by 7 matches to 2 in our first men's doubles match of the season played at Windsor on June 11th. The weather was ideal, the grass courts in fine condition and the opposition stronger than in previous years. A most enjoyable match and we look forward to a tighter struggle in the return on August 20th.

Lunch hour tennis is becoming quite popular, but there are still far too many vacant spaces on the booking sheet. So please make use of this facility to ensure that you get full value for your money. Subscriptions, by the way, would be much appreciated.

R. W. Smith

WISDOM OF THE EAST

(more utterly useless facts for the newsletter)

1. The total energy capacity of storage batteries mounted in motor vehicles in Great Britain exceeds the present total output from nuclear power stations.
2. Sheep, if allowed to multiply unrestrained, would cover the earthy part of the globe with mutton in 76 years.
3. The 600 MW reactor at Dounreay is no larger than a Union Radio ionosonde.

"Have you heard of the micro-miniature electronics firm that became so successful that they had to move to smaller premises?"

J. N. Tyler
(Singapore)

LETTER TO THE OUTSTATIONS

Dear Colleagues,

The other day it came to mind that the greenery round the Station no longer consists entirely of slim saplings but contains trees proper. We have been here ten years. In fact the precise hour of one group's rehousing may be seen on an old barograph record. At 11 a.m. on 1st June 1956 a large disturbance may be seen. This was caused by your editor carrying the thing a few hundred yards to the new building.

The previous 'new building', so called in a photograph of 1929, has been recently recommissioned. After redoration and minor alterations it now houses staff concerned with satellite predictions and H.F. ionospheric propagation.

To call either of our buildings new is not very apt at the moment. However, we have only to keep it up long enough and the title will be one with the New Forest, the New World, New York and Newgate Street.

Antique anomalies pleasing to such as,

Yours sincerely,
The Editor