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THE SOLAR-POWERED ANTHROPOLOGIST

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In 1959, when I began dissertation research on the island of Rotuma. in what was then the British Colony of Fiji, the state of information gathering, storing and processing was rather primitive by contemporary standards. This was the pre-transistor, pre-computer, even pre-calculator age. My essential equipment consisted of a Baby Hermes typewriter (which performed magnificently) with a goodly supply of typing and carbon paper, a reel-to-reel tape recorder (which lasted for less than a month in the humidity before breaking down), and box full of nearly 10,000 slips of 3" x 5" slips of paper foisted on me by Dr. Lindsey Verrier, a medical demographer in Fiji who insisted I bring these along in order to copy down registry data that he assured me would yield all sorts of benefits to a cultural anthropologist. (He was right, but I had no idea at the time how much time and effort would eventually go into such a compulsive endeavor.) For entertainment, and keeping in touch with the outside world, I bought a huge Telefunken short-wave radio (with vacuum tubes) that ran on a massive dry cell battery. I remember spending many delightful, and some frustrating hours straining to hear news and commentaries emanating from various parts of the world; music was hopeless because of fade-outs and static.

I kept field notes in small wire-bound notebooks and faithfully transcribed them every two or three days on the typewriter, adding commentary and theoretical speculation when the spirit moved me. I organized these typewritten notes by Murdock's <u>Classification of Cultural</u> <u>Materials</u>, slightly modified to suit the circumstances and my particular interests. Carbon copies were organized chronologically and sent back home at every opportunity for safe-keeping. It was all very low tech, but a reasonably efficient way of recording and storing data. By carefully crossindexing notes I was able to locate, while still in the field, most of what I had already recorded about a given topic. When I returned from the field, two years later, my notes were sufficiently well-organized to enable me to write my dissertation, while teaching full time, within a nine-month period.

I cannot claim the same efficiency with regard to the demographic data recorded on the 3" x 5" slips of paper. My brother, who was assisting me at the time, and I spent several weeks copying birth, death and marriage records onto the slips. It became an obsession and we managed to get nearly complete records back to 1903. We ended up using about 9000 of the 10,000 slips Dr. Verrier had put in the handmade case he generously gave me. The rub came when trying to make use of these materials. The first step was to sort them into sibling sets, which was quite a chore since Rotumans did not use surnames; we had to rely on comparing fathers' and mothers' names, along with information concerning age, residential location, etc. Doing record linkages became a dedicated hobby within my household. I calculate that nearly two work years went into this laborious, but often interesting puzzle-solving chore. The next step was to code these data so that they could be analyzed. This took another year or so of intensive effort to accomplish. The coded data were then punched onto more than 23,000 IBM data cards and after some attempts at analysis - very expensive and not terribly productive - I gave up and put the boxes of cards in a storeroom where they languished for over twenty years. It was just too much trouble to talk to a programmer for a couple of hours in order to explain what piece of information or analysis I wanted, wait for a couple of weeks while he worked out a program, then wait for time on the mainframe. After doing this for a several months and not even getting decent tabular data. I decided it was not worth the trouble.

Fortunately computer technology has come a long way since then. My tiny laptop computer, running Dbase III+, is far more powerful than the mainframes of the early 1960s. I did not become a computer junkie until 1984, when I bought one of the first Macintoshes available in Hawaii. At first it was more of a toy than a productive tool, but I upgraded as each new innovation appeared - lots more RAM, a 20, then 80 megabyte hard disk and when the University of Hawaii computing center announced that they would be phasing out their card sorting equipment I decided it was time to convert my demographic data to a Macintosh format. This required a series of awesome transformations. The cards were run through a sorter and the data read onto an IBM magnetic tape. The data were then transfered to an IBM disk, then to a DEC disk that was set up to transfer information over University lines to downloading personal computers. I now have the data on my 80 megabyte hard disk and may even do some analysis one of these days.

My reason for bringing up all this past history is to emphasize the value of having a computer in the field, especially if one is collecting systematic information that lends itself to database analysis. It also can be a major boon for organizing field notes and optimizing one's ability to locate information quickly both in the field and when writing up. I had all this in mind when I returned to Rotuma to resume field work during the summer of 1988. My wife, Jan Rensel, a doctoral candidate in anthropology at the University of Hawaii, and I brought with us two Toshiba laptop computers, a Diconix portable printer, some standard converters for reducing 220 volt current to 110, and of course, the regular AC adaptors to recharge the NiCad batteries in each machine. For safety we took along a surge protector to plug the adaptors into. It all seemed simple enough. We had visited Rotuma the year before - my first time in 27 years - and stayed for a couple of weeks. We had arranged for accomodations in a village with its own generator, which was "normally" run for three hours every evening. This would allow enough time to keep the laptops moderately well charged, and we planned to do our note recording and data entry during the time when the generator was running. True, during our first visit the generator was down and in need of repair, but we were assured that it would only be a matter of a few weeks before it would to be operating at full capacity.

When we arrived in Fiji a year later, and tested our simple little setup (prior to going to Rotuma), we ended up blowing the fuse in our host's house on our first try; on our second try the converter blew. So we decided to give up on that arrangement and went shopping in Suva for a more practical solution. We found an inexpensive universal converter that would directly reduce 220 volt current to anywhere from 12 to 3 volts direct current, and had an adjustment for polarity (which turned out to be critical since the laptops and printer had different polarities). The laptops and printer both take 9 volts direct current and the new converter seemed to work just fine, although in a later test it was found to emit irregular waves and a higher than specified voltage (in the end it, too, went up in smoke). So, when we left for Rotuma with our modified system, we felt we were reasonably well prepared to embark on the road to electronic ethnography. When we arrived in our village we found, however, that the generator was still down and our cottage had no source of electricity. A dispute had arisen over how much would be charged for the repairs to the generator and who would pay for it. As it turned out, the village was without electrical current for nearly two years. So much for our use of the computer equipment! A couple of households in the village had generators of their own, but it turned out to be too much of a hassle to plug into their systems on a day-in, day-out basis, so we ended up abandoning the laptops altogether. We wrote our fieldnotes by hand on 4" x 6" cards, which we brought along as a backup, along with a plentiful supply of pens and pencils. We took voluminous notes, and being committed to getting them into the computer, spent hundreds of hours following our return to Honolulu typing them in.

Our plan was to return the following year (1989) for six months, but this time we intended to be prepared for any contingency. We decided to buy a generator of our own and bring it to Rotuma. It would have to be small enough in size and weight to take on an international flight. The first thing we discovered is that most generators are very loud, and would be disruptive if located close to a household. After some research and false starts (equipment returned to stores), we settled on a Honda EX650, which had the virtue of being relatively quiet as well as of convenient size and weight. It produces 550 watts of current for extended periods, and 650 watts for short bursts - quite sufficient for the purposes we had in mind. It also had a reputation for reliability. We decided that as long as we were going to have our own generator (producing 110 volts), we might as well bring along our Macintosh and hard disk as well (the Mac was rated at 75 watts and the hard disk at 40 watts, although one is advised to allow double the rated values for safety sake). We would return with a vengeance - three computers and a printer. In order to protect the Mac against voltage fluctuations that we knew to be inevitable, given the likelihood of dirt and water in the benzine on Rotuma, we bought a TrippLite voltage regulator, which protects against brownouts as well as spikes. It's a rather heavy piece of equipment, but necessary under the conditions. We also bought a couple of low wattage, high intensity lamps to run off the generator for general lighting as well as to shed light on nighttime computing.

Our move toward solar equipment happened quite by accident. The generator has a special outlet for charging 12 volt batteries, so we thought it

would be a good idea to obtain an ordinary car battery in Rotuma, keep it charged with the generator, and use the battery to charge the laptops' NiCads (or to run the laptops directly). We promptly bought a 12 volt automobile adaptor for the Toshibas, which plugs into a car's cigarette lighter. Since we were not going to be plugging it into a car, however, we had to buy a 12 volt socket that could be attached directly to a battery. The one we bought turned out to be rather flimsy, and came apart after a few weeks of usage, but more about that later. On inquiry, we were advised that although the generator could be used to directly charge a battery, it would be advisable to buy a proper battery charger, as this would protect against overcharging and damaging the battery. Since we were disposed by this time toward caution - we were absolutely determined to use computers in the field as a matter of pride if not practicality - we decided to bring along a battery charger. There are several inexpensive brands on the market and we made some telephone inquiries to find out what was available and for how much. We were obviously taking all of this very seriously.

In the process of making inquiries into a battery charger we discovered that most sales personnel were utterly ignorant and could not answer the simplest questions, until we called a shop that specialized in batteries. The proprietor patiently answered our questions, convinced us that the most expensive unit on the market was well worth the cost (\$200), and asked what we were going to use for a battery. When we told him that we planned to buy a battery in Fiji he sounded horrified. In the first place, he pointed out, car batteries are not well suited for the purpose we had in mind, being designed for short bursts of high energy in order to start vehicles instead of the long term low energy requirements for running computer equipment. In the second place, he informed us that the batteries available in Fiji were of inferior quality, and that he had been supplying batteries to individuals there who had become disillusioned with local products. He recommended a dryfit Prevailer battery made by Sonnenschein, the same company that made the battery charger he recommended. The Prevailer line of batteries are deep cycle, sealed gel units that are used in various marine applications and are used to run electric vehicles such as golf carts and wheelchairs. They have numerous advantages when compared with ordinary car batteries, including the ability to withstand shocks and vibrations, to recover 100% from deep discharges, and to withstand a wide range of temperatures. They also have a reputation of lasting for many years and since they are sealed neither require maintenance nor do they emit gasses or corrosive acid fumes. Because of these latter qualities, furthermore, airlines permit them to be shipped as baggage, whereas ordinary car batteries are not permitted. We ended up getting the heaviest battery (66 lbs.) permitted as ordinary luggage on international flights (maximum 70 lbs.). The cost of the battery (\$250) was considerably more than an ordinary car battery, but we decided the advantages warranted the expenditure, especially since we planned to return to Rotuma periodically for several years to come.

Having thus committed ourselves, we asked about the possibility of charging the battery with a solar panel, something we had had in the back of our minds anyway. Our newly found, and trusted, advisor waxed enthusiastic. He promised that if we would buy the battery from him, he would obtain for us at dealer's cost the solar panel of our choice. After further consultation we decided on a Sovonics flexible panel, commonly used on boats. Although flexible panels produce somewhat less current than rigid glass panels, they have the advantage of being more durable (one can punch a hole in them and they'll continue to work) and less subject to corrosion. The latter was a consideration since our cottage on Rotuma is on the beach, subject to sea spray. We bought the largest panel available (49" x 25"); it posed no problems to transportation by international baggage, although classified as oversized (it is, however, quite lightweight). Our advisor instructed us where to go to buy the types of wiring we would need (heavy duty outdoor wire to connect the panel to the battery, lighter gauge indoor wire to connect the equipment to the battery; wire is relatively cheap and not too bulky, so it is advisable to get more than you think you will require).

By this time we had already changed our mindsets to favoring the possibilites of solar over generator-produced electricity. We found a shop that specialized in 12 volt equipment, mostly for marine use, which of course, given the location of our cottage, suited us very well. We purchased two 12 volt fluorescent wall lamps and an 8 inch fan. From Radio Shack we bought a voltmeter with which to monitor the battery's charge (it also allowed us to check the voltage of ordinary flashlight batteries as well as the output from the generator, thus turning out to be a most useful piece of equipment). Thus equipped, we boarded our Air New Zealand flight for Fiji, paying only a small amount for excess baggage as a result of the extra pieces.

Our first big problem was Fiji Customs. We had the misfortune of arriving on Friday evening prior to a long weekend. Our extra boxes and carrying cases was a clear signal for the officers on duty, and they examined the equipment with great interest. We had thought that our research visas. which were valid for a six month period, would suffice to convince them that the equipment was for use in a specific project. They did not. The officials were particularly interested in the Macintosh, the generator, and the solar equipment; the two Toshiba laptops they explicitly let by on the grounds that they were "personal" computers. They asked for receipts for the equipment, some of which we had, some we did not. We had no papers for the Mac since it was several years old. They decided to hold the Mac and other items of interest and told us that we could begin procedures to redeem them after the long weekend. Since we had only planned to be in Fiji for two weeks before leaving for Rotuma we were quite apprehensive. We were also concerned about being hit with exorbitant customs fees. As it turned out, with the assistance of a Rotuman friend in the Customs Division, we managed to weave our way through the bureaucratic red tape in time to release the goods, for a small customs fee, a few hours before our flight left for Rotuma. The lesson - check into customs regulations and bring required documentation if you plan on bringing high tech equipment to a foreign destination. And be prepared for bureaucratic hassles.

Having our equipment in hand was not the end of our problems, however. We still had to get the materials to Rotuma, and Fiji Air's domestic baggage allowances are much more restrictive than international flights allow. To be specific, we were only allowed 15 kilos each (which barely accommodated basic necessities). Nor were we allowed to take excess baggage on the 14 seater Fokker Heron; as a result of weight considerations they even offloaded the mail! We thus had to arrange to ship the equipment on the next boat to Rotuma, which was rumored to be scheduled for a couple of weeks hence. But one thing our cynical Rotuman friends have taught us about boat schedules - multiply at least by two, and then don't count on anything. In fact the boat did not arrive until six weeks later, but it brought our gear and we finally got a chance to try it all out. Everything worked splendidly. The Honda generator, though coughing occasionally on watery fuel, ran the Macintosh without a hitch through the line conditioner. But while it was comforting to have our trusty Mac at our disposal, we somehow always felt a little awkward running it. The generator required fueling up, and watching the clock so as not to run our of fuel; we were always conscious of the cost, and the noise. In contrast, the laptops became the real stars of the show, once we got to feel comfortable with the DOS format. What was really appealing was the fact that they ran on silent, free energy from the sun.

The solar system, which was exceptionally easy to set up, generated more electricity than we could use, the battery never dropping below 12 volt output, even on cloudy days. It ran our two laptop computers, the fan and two bedroom lights without any serious regard for rationing. It was, in short, a real pleasure. The fan was a major luxury on hot, humid days, making it possible to work in much greater comfort, and the bedroom lights gave us the opportunity to work in the evenings by other then a Coleman lantern.

We encountered only a few minor hitches. One concerned the cigarette lighter style outlet we had purchased. After a fair amount of plugging and unplugging it broke apart. We managed to tape it together and kept it operational, but for insurance got permission to cannibalize a neighbor's abandoned truck for his cigarette lighter. Having two outlets allowed us to keep at least two applicances plugged in at any time.

As soon as we returned home in January 1990 we began planning for our return visit, and ordered catalogs from two companies specializing in alternative energy products that do a mail order business, Real Goods (966 Mazzoni St., Ukiah, CA 95482; tel. 800-762-7325) and Solar Electric 175 Cascade Court, Rohnert Park, CA 94928; tel. 707-586-0690). The <u>Real</u> <u>Goods Alternative Energy Sourcebook</u> (\$10, refundable with your first \$100 order) contains over 300 pages of information on alternative energy systems and appliances, plus valuable articles on planning and constructing such systems. One can order from it anything that runs on 12 volts, from refrigerators to power tools to vacuum cleaners. The <u>Solar Electric Catalog</u> (\$5) is more limited in scope but contains some valuable additional items.

Based on our previous experience, we purchased from the catalogs a double outlet of much better quality than the one we had previously purchased, a 25 foot extension cord that permitted us to use the fan and computers all over the house, a battery charger that runs off 12 volts and charges lower voltage NiCad batteries, and a converter (with polarity switch) for converting 12 volt power to 9 or 6 volts. With this equipment we were able to run tape recorders, our short wave radio and other electronic equipment without a hitch.

We are now totally sold on the advantages of solar power in many field locations where anthropologists do research. Even where 110 or 240 volt electricity is generally available it may still be worthwhile for the ethnographer to invest in solar, if only to insure an uninterrupted supply and to protect sensitive equipment from power fluctuations.

Not the least of the value of our solar setup was the example it set for the people in our village. While they were enduring major problems keeping their generator running, we enjoyed an endless supply of electricity. They were engaged in constant squabbles about who was to pay how much for fuel, while we received energy free from the sun. For some reason Rotumans, like so many other people in the world, are hooked on fossil fuel systems. They are seeking subsidies of up to \$F1,000,000 for a central power plant to be run on diesel fuel they will be unable to afford. For that amount of money each of Rotuma's approximately 500 houses could have a solar system costing \$F2,000, which would provide enough electricity to meet all of their needs without further costs. Since each household would be power independent, a major source of contention would be removed, so there would be social and political benefits to the community as well. Furthermore, it would relieve somewhat the island's dependence on the outside world, since all fossil fuels must be imported. We would like to believe that our example had at least a small impact on Rotuman thinking about energy, and will lead them to consider alternatives other than fossil fuel in their quest for an improved standard of living.

A number of excellent books are available on the subject of setting up solar systems, the most comprehensive being <u>Living on 12 Volts with Ample</u> <u>Power</u>, by David Smead and Ruth Ishihara.