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WhistleSoft, Inc.

It was 1993, and LANL had a reduced budget, significantly smaller than they had hoped for. There was a distinct possibility of some RIF's. That stands for "Reduction In Force", which is a euphemism for firing a sizeable number of people. To ease the social turmoil that would cause, the laboratory management had cajoled *its* manager, the University of California, into offering lab employees an enticing VERIP package.

This acronym stands for "Voluntary Early Retirement Incentive Plan." If you were already vested in one of the two University of California retirement plans, the offer of an added year of your present salary ought to look pretty attractive. Particularly if you were somewhat uncertain how things were going to go in your present line of work. Another nudge might be that you weren't sure of what was going to happen to LANL. The University of California, which had administered the Laboratory since the days of the Manhattan Project, might well be replaced by a consortium of corporations that happened to win a bidding war for the management contract. Such was the will of Congress.

I was one of those people. I had 22 years of service, although I was only 57 at the time. It might well be time for me to take the VERIP and try something new. I had come to LANL because of LAMPF, the acronym for "Los Alamos Meson Physics Facility," often referred to as a "meson factory." The Department of Energy had recently decided to drop the funding category named "Medium-Energy Nuclear Physics." The LAMPF proton accelerator was therefore to be re-purposed as a "neutron factory," and that was a branch of nuclear physics I didn't find so interesting.

In a separate essay I have written about my adventures in Artificial Intelligence and the resulting fascination with the NeXT computer. If I took the VERIP, could I make a living as a consultant for the NeXT and NeXTstep community? Well, it seemed worth a try. So I did take it, much to my group leader's relief – he didn't have to fire anyone in T-5, our small theoretical group, after all. With my wife Maggie as secretary-treasurer, we formed a two-person corporation, WhistleSoft, Incorporated.We set up its corporate office in the extra, front bedroom of our house at 168 Dos Brazos.

Why the peculiar name? Obviously, it's an oblique reference to the MicroSoft Corporation, but we weren't expecting to emulate its success. Also, for those who don't know Spanish Spanish, the verb "silbar" means "to whistle, hiss, or boo." In local New Mexican Spanish that verb doesn't hardly exist, but the pueblo kids in the area do make whistle-toys called "silbatos."

As it turned out, my career as a NeXTstep consultant didn't go very far. The NeXT computer, although a beautiful machine ahead of its time, was too pricey to make a dent in the commercial market. Eventually the NeXT Corporation disappeared, soon after its founder, Steve Jobs, returned to Apple. We were able to live comfortably on my university pension, supplemented by a Visiting Scientist Agreement with T-5 doing yet more medium-energy calculations.

About this time the Los Alamos County's Small Business Center began hosting a set of lectures by Jim and Gail Greenwood on SBIR grants. *This* acronym stands for "Small Business Innovative Research," a Congress-mandated program. In it, each government agency must set aside 1% of its total funding for research and development to fund small businesses, typically technology start-ups, that responded with proposals responding to R&D subjects of interest to that agency. The grants for a successful first-

time submission were $75,000 for one year, small but enough to get a company started on its proposed project. After completion of that time, the company could then submit a proposal for a second-phase continuation of their project. If successful, this extension would provide $900,000 for a two-year period. Pretty good for getting a small start-up going for its first two years. After that, it was up to the company to provide any further funding for R&D, hopefully already earning money from sales of their products.

At that time, because of the VERIP, there was a lot of retired talent hanging around without much to do. (We were forbidden from going into the Lab for a few months following one's retirement date.) So that, together with the nudge from the Greenwood lectures, got a bunch of us looking over the list of topics that various funding agencies were interested in funding for SBIR grants. The most interesting of these agencies for those of us who were physicists were, of course, the Department of Energy and the National Science Foundation.

It turned out there was one topic that Dick Cooper and I thought we could respond to with some good chance of success. One area of particular interest to the DOE was the training of personnel who would be running the various particle accelerators that the agency had built and for which it provided operating funds. There were also, at that time, a number of particle accelerators being developed and commercialized for medical purposes. So, there might be a market for a training program.

Cooper was the former group leader of the LANL Accelerator Theory Group and had a decade of teaching experience. He would be the chief "domain expert" for charged-particle beam physics in our proposal. I also had some teaching experience and had done some work in beam optics soon after coming to work with LAMPF, then under construction. So it looked like we might be able to put together a nice proposal for Phase-I SBIR funding. The fact that WhistleSoft was already in existence and could serve as the submitting company was a plus.

The proposal we submitted in February, 1994, was entitled "A Multimedia Tutorial for Charged-Particle Beam Dynamics." It was our opinion that the best way to learn something was to be actively engaged in the process. We thought a good way to do that was to provide a self-paced game-like program that could be run by the learner on his or her personal computer. We proposed using the interactive multimedia.

In Phase-I we would seek to determine the best way of branching between different skill levels of exposition, making transitions between hyper-text displays, colorful interactive graphics, and videos, possibly with accompanying sound. The eventual product resulting from this research would be a computer tutorial that would run on Microsoft Windows computers. The course could be delivered on CD-ROM disks, together with associated student workbooks and a teacher's manual. We hoped to be able to sell this tutorial for a cost small enough to allow for a large volume of sales for this software.

In the 25 page proposal we sent in we intended to use NeXTstep to facilitate the development of several sample tutorial modules. If we were able to get Phase-II funding and beyond, the more complete set of tutorials we created would be ported to Windows. We would already, in Phase-I, begin exploring possible arrangements with software publishers for their commercial distribution.

As an example of what we wanted to do, here are two sample screens (but missing the colors) that we included in the proposal:

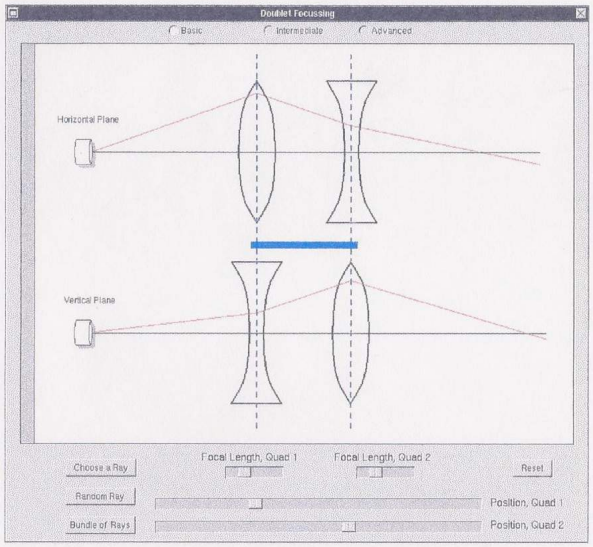

Fig. 1. Quadrupole doublet focussing.

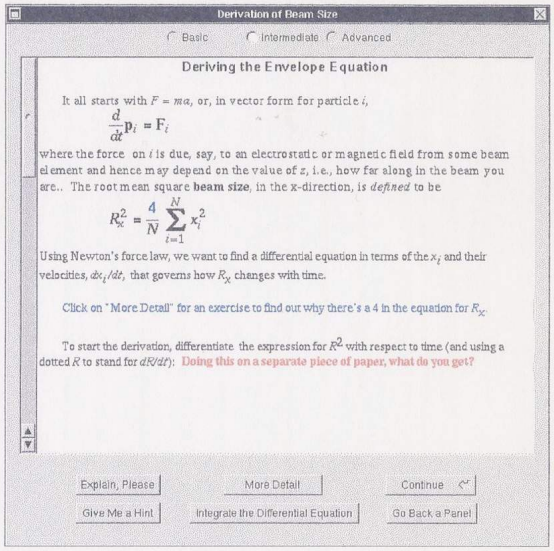

Fig. 2. Derivation of envelope equation.

Figure 1 shows what a typical interactive "laboratory" would look like. Note the options buttons at the bottom of the screen, which allow the student to choose a different (possibly random) ray or even a bundle of rays going through the lenses, the ability to change the focal length or positions of the (quadrupole) lenses. Figure 2 shows a typical page of (advanced) textual material, with some parts of it in red hyper-text, linking the student to more information about that subject. Also, at the bottom of the page, the user has options such as asking for a hint or a more complete explanation, on how to integrate the differential equation they are expected to derive, and for navigating back and forth within the tutorial.

To cut this description of the Phase-I proposal short, we were notified in June that our application for an SBIR grant was reviewed by knowledgeable referees, and, on their favorable reports, it was approved for funding. There was of course a bunch of paperwork to get through before any money began to arrive. Nonetheless we got busy doing the work we had proposed to do. The prototype tutorial, called "Beams and Focussing," discussed three kinds of focussing devices. Our prototype eventually involved more than 40 pages of textual material (similar to that shown in Figure 2 above) with equations and hyper-text links when necessary. There were also a dozen interactive figures (like Figure 1 above), and five extensive interactive laboratories, sometimes with animations or video clips. The student was not required to go through all this material in a linear fashion, as any given topic can be arrived at in more than one way. As we worked developing this prototype, we made extensive use of outside user-testers and gave several show-and-tell demos and seminars about the project.

As we neared completion of the prototype, we started thinking about how to prepare a proposal for Phase-II funding. Before then, in March, 1995, we submitted a lengthy Final Report on what we had accomplished during the Phase-I year. Basically, we claimed that we had met or exceeded all of the technical objectives that we had in the Phase-I proposal. One disadvantage of the *paper*-based Final Report was that did not show the benefits of the interactivity, sound, video, and animations that the student sitting at the computer console would experience. Anyway, in April, we submitted a proposal

for Phase-II funding, promising to continue building tutorials for charged-particle beams. We also discussed how we planned to commercialize them and how we could take advantage of our learned expertise to develoop other tutorials on science and technology subjects. Somewhat to our surprise, we were awarded the much larger grant.

The Phase-II grant allowed us to begin the transition from NeXTstep development to the much more prevalent Microsoft Windows and Apple MacIntosh platforms. To do this, we were able to buy somewhat expensive, specialized software packages, including Macromedia's Authorware and Adobe's Photoshop. We were also able to hire, as consultants, a number of fellow retirees to help with the design and programming of the set of tutorials we had in mind. About this time Dick Cooper dropped out of the project and I took over the role of Principal Investigator. We had not actually used up all the Phase-II funding by the end of our second year, but we were allowed to continue using it afterwards until it ran out around the turn of the century .

The first tutorial we produced was entitled "Vectors" and that ended up becoming our best selling product. We eventually completed four other tutorials in this beam-dynamics series: "Forces," "Motion in Electromagnetic Fields," "Dipole Magnets," and "Quadrupole Magnets." Obviously, successively more technical, in that order. These tutorials came to be declared the "Best Teaching Software" in the annual contests held by the Computers in Physics journal.

As regards commercialization, all of these tutorials were packaged, distributed, and sold for us by Physics Academic Software, a small publisher based at North Carolina State University. For that we earned royalties on what they sold. Another source of income for us was from the Electronic Software Distribution system at LANL. Our attempts to sell them on-line through E-Bay, however, were unmitigated flops.

In view of our SBIR success, we also submitted Phase-I proposals in response to other SBIR solicitations from other agencies, such as the NSF and the Department of Transportation. Unfortunately, these did not receive funding approval, despite my feelings that at least some of them were worthy of it. Another project which *did* receive some funding was a small LANL Technology Transfer award for developing a module on Legendre Polynomials. This was done in hopes of leading to an interactive course on Mathematical Methods using materials provided by Dick Jacob at Arizona State University. That didn't happen, sad to say.

By about 2003 computer technology had begun moving past WhistleSoft's developed expertise. Our Authorware software no longer provided versions for MacIntosh computers. The latest updates of Microsoft Windows could no longer run the tutorials we created using Windows 98. Our sales were becoming smaller every year and it was hardly worth the effort I had to put in on doing the corporate accounting and paperwork. Hmm. Maybe it was about time for me to *really* retire. I eased over into working with some of my T-5 (now renamed T-2) former colleagues on a number of particle physics and astrophysical problems. And, we dissolved WhistleSoft corporation in 2007.