

Who Am I? What qualifies me to make accurate statements and not just prophecies about nature and the human relationship to the environment?

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What qualifies you?

A couple of weeks ago, a visitor to my website sent me an e-mail in which he posed the following question:

“...I understand that you have a PhD in statistics and have worked for the DOD and studied literature regarding your subject matter; however, what qualifies you to make accurate assessments and not just prophecies about nature and human[kind]’s relationship with the environment? What were some of your specific positions/jobs, etc?”

My immediate reaction was that who I was and what I had done were irrelevant – that the assessment of the truth or worth or utility of my writing should be based solely on its own merits. Perhaps this is because criticism of my views is often in the nature of *ad hominem* attacks (“racist, sexist, warmonger” etc.), rather than in the nature of reasoned arguments of why my views may be unfounded or incorrect. Moreover, most of my writing is not concerned with prophecy at all – it is mainly concerned with *strategy* for accomplishing a desired type of planetary outcome. I am not concerned with prediction of an *unconditional* future of some sort (i.e., an “average” prediction that is not premised on any particular conditions or set of assumptions), but with “playing the game of life” in such a fashion as to achieve a *conditional* future of a desired sort (e.g., a planet with an intact biosphere and an extant human race (the desired outcome), brought about by the actions of a synarchic planetary government (the condition)). I am sufficiently optimistic that I believe that it is possible for someone (or some group) to counter the out-of-control economic system that is destroying the biosphere and causing mass extinctions, and, at the right time and under the right conditions (e.g., in the wake of a planetary catastrophe, such as the outbreak of global nuclear war), implement a quite different, long-term-sustainable system. In short, I am much more interested in convincing people to work toward a desired planetary goal, than in simply conjecturing what the future might be in the absence of

any assumptions about efforts that might be undertaken to modify or control it. My interests lie more in strategies for planetary *control* than in prediction (or “prophecy”) of an uncontrolled system.

When I received the e-mail query, I was vacationing in Spain. Although my initial reaction was that my credentials were not relevant, by the time I got back to Zambia I had tempered my views somewhat. (This is not the first time that I have received enquiries about my credentials.) While examination of a thesis on its own merits, independent of consideration of the author or source, is, in my view, the preferred means of establishing the truth or validity or utility of an argument, consideration of the source may be a useful way of quickly assessing the merits of a piece. It is a little like accepting medical or health advice from someone based on his credentials – if the person is a recognized expert, such as a registered medical doctor with a good professional reputation, the likelihood that what he is saying is correct or reasonable is probably pretty high.

And so, I answered my correspondent’s question with a quick summary of my approach and my credentials. Here, with considerable amplification, is my response. While I can see the utility of relying on an *ad hominem* assessment as a quick and approximate surrogate for assessing the validity of someone’s work or assertions, it can never be the equivalent of a direct assessment of the work itself. Although I have a PhD in a branch of mathematics, if you ask me what the sum of 37 and 47 is, and I (or Jesus Christ, or anyone else) tell you (inadvertently) that it is 74, the correct answer, the truth, is still 84 (even God cannot lie with mathematics). While *ad hominem* arguments may be legitimately used to draw initial attention to someone’s work, they can never serve as a basis for establishing truth, validity, or utility.

Finally, I will emphasize that what is important in my work lies in the realm of strategic planning (and game theory and systems engineering, and whatever else is useful in assisting rational planetary management), rather than in prediction (“prophecy”) of what may occur in an uncontrolled world, and so it is my credentials in those areas that I address here. I will, however, also include a few comments on my credentials relating to my “predictive” abilities.

Some preliminary remarks on my approach to planetary management

If you are asking whether I have some sort of formal certification or experience in “planetary management,” then, of course, I don’t have any (and neither does anyone else, since we are “playing this game for the first time”). Mainly, I just use logic -- ratiocination. And I read a lot. I am not alone in my forecasts or predictions of what lies ahead. M. King Hubbert published his seminal work in 1949 (see Kenneth S. Deffeyes' *Hubbert's Peak*, 2001). Catton wrote his classic, *Overshoot*, in 1980. Nicholas Georgescu-Roegen wrote *The Entropy Law and the Economic Process* in 1971. Herman E. Daly wrote *Beyond Growth* in 1996. The late René Thom did his work on catastrophe theory decades ago, as did Jay Forrester (on system dynamics, in which the tendency of dynamic systems to fail catastrophically if commonly observed). Thomas F. Homer-Dixon wrote *Environment, Scarcity and Violence* in 1999 (based largely on earlier work). Joseph Tainter wrote *The Collapse of Complex Societies* in 1988. David and Marcia Pimentel wrote *Food, Energy, and Society* in 1979. Richard Leakey wrote *The Sixth Extinction* in 1995. Michael Klare wrote *Resource Wars* in 2001. Liddell Hart wrote *Strategy* in 1929. Machiavelli wrote *The Prince* and *The Art of War* five hundred years ago, and Sun Tsu wrote *The Art of War* in 500 BC. The best overall source of information on the end of the petroleum age is Jay Hanson’s *Dieoff* website, <http://www.dieoff.com> , which

has been online, I believe, for the better part of a decade. My analysis of a situation includes a review of the facts, reading what many other people have to say on similar matters, technical analysis using the best appropriate tools, creativity, and common sense. My qualifications to make accurate assessments are, to a degree, dependent on the validity of what many other people have to say (for example, state-of-the-world data, history, other knowledge, and methodologies). If you reject their statements of fact or conclusions, then you may reject mine as well.

When I investigate something significant, I usually collect a lot of information about it, and I spend a lot of time thinking about it. My major piece on population and the environment is *Can America Survive?* I got the inspiration to write this book on a weekend visit in 1993 or 1994 to the Zomba Plateau in Malawi, where I was really distressed to see the clearcutting of virgin forest and replacement with tree plantations. I actually rewrote the book two times, before I was satisfied with it. Over the course of the next five years, while I worked on the book (in my spare time), I purchased about 600 books on population and the environment (and related subjects), and spent about \$10,000 on these books and computer software (data and software to perform statistical analysis). In 1998, I spent several months assembling tables and graphs for appendices to the book, and in November of 1998 I rewrote the text for the third and last time. During the course of writing the book, I asked friends (several with advanced technical degrees) to review it, and I responded to their comments.

My record in prophecy

While much of my work is concerned with logical analysis of a problem and the application of the techniques of systems engineering and other methodologies to find a solution, there are some instances in which I state opinions and make predictions (e.g., that conservation is doomed, that the current global

industrial system will likely collapse catastrophically, and that global nuclear war is likely). There is a large body of knowledge concerned with this topic (including statistics, simulation and modeling, systems analysis, technological forecasting and content analysis). One of the difficulties in assessing the abilities of someone working in this area is that predictions involve the future, and we often do not have an opportunity to objectively compare predictions to eventual outcomes. The ancient Hebrews had a good test of a prophet – he was asked to make a prediction, and if it didn't come true he was put to death. Now, I'm not recommending that in my case, but I would like to point out several things.

First, as recommended by Sir Isaac Newton (in his classic book, *Observations Upon the Prophecies of Daniel, and the Apocalypse of St. John*, Oregon Institute of Science and Medicine, 1991), I do not place specific dates on my predictions. This practice alone is the single most important factor in enhancing the validity of a prediction or "prophecy." I am pretty sure, based on existing scientific knowledge, that the current global socioeconomic system will collapse catastrophically – I am just not very certain about the date. (About the only time I have deviated from associating dates with my predictions is my conjecture that this decade (2001-2010) is the one in which Hubbert's Peak is occurring. I am not at all alone in this conjecture, and the recent rapid rise in the price of oil and the inability of the world's producers to increase production seems to be bearing it out.)

Second, I *do* place dates on all of the articles that I write, so the reader is always aware when it was written (and that I am not making a prediction after the fact, as is done, e.g., in some instances in the Bible). Third, I rarely revise my pieces, except in the week or so after I first post them (to improve wording, or add some explanation or amplification). Fourth, consider the topics on which I have made observations or predictions, and assess

whether my views have been on or off the mark. I believe that you will see that I am generally on the mark. I started writing *Can America Survive?* in 1993 or 1994, and published it in 1998. Except for very minor updating (mostly repair of broken hyperlinks), I have not revised that work. (I have little respect for someone (perhaps I should say “for the *writings* of someone,” to avoid making an *ad hominem* remark), like Ernesto (“Ché”) Guevara (or Karl Marx), who keeps revising his work as he goes along. This is a sure indication that the fellow has not thought things through very well, and does not have a comprehensive, stable, or robust theory that is useful for prediction. This is not to say that I would not revise my observations or conclusions in the light of new evidence – but, like Einstein’s theories of relativity, a useful theory in any field should be able to stand the test of time and rarely have to be modified.)

Consider some of the predictions / observations / assessments that I have made. On the matter of immigration, long ago I pointed out the folly of our porous borders and expressed my view is that it is rapidly changing (destroying is perhaps the better word) our American culture. Last night I saw a CNN special on immigration (*Immigrant Nation, Divided Country*), in which it was estimated that there are now 7-20 million illegal aliens in our country. (The current situation is absolutely incredible – the Under Secretary for Border and Transportation Security of the Department of Homeland Security, Asa Hutchinson, stated on the program that it just didn’t seem humane to deport an illegal alien family after they had two babies who were US citizens (under our “birthright” policy of granting citizenship to any baby born on US soil, regardless of circumstances).) I wrote long ago that America’s absurd immigration and open-border policies, if continued, would destroy the country’s culture. Many of the people interviewed on the CNN program simply didn’t see the harm in what was going on, and expressed the opinion that these people are just trying to improve themselves. Little wonder! After

almost forty years of mass immigration (since the Immigration Act of 1965) and a massive amnesty of illegal aliens, many current Americans are recent immigrants, and many of them are illegal immigrants, or amnestied illegal immigrants, or the progeny of illegal immigrants or amnestied illegal immigrants. A long time ago, I warned of the fact that immigration and the consequent population explosion would have dire consequences for our traditional culture. (It has certainly devastated our environment – as the population has doubled over the last half-century, our national parks have become intensely crowded, the open spaces are mostly gone, you can no longer swim in rivers or creeks near most towns, and it is no longer possible for a man of average means to own a cottage on a lake near his home town.) I cited works such as Jean Raspail's *The Camp of the Saints*, Peter Brimelow's *Alien Nation* and Arthur M. Schlesinger Jr.'s *The Disuniting of America*. The warnings of these and other authors have been ignored, and America, Canada, Australia, Britain, France, and other countries that have allowed mass immigration are now in the process of losing the very cultures that once made them strong. I wrote of my dream as a child of the man feeding pigeons in the park (generous-to-a-fault, open-door America), who was eventually consumed by them (America destroyed by immigrants and terrorists). Was I far off on this assessment?

Long ago, I stated my opinion (“predicted”) that the environmental movement was doomed, that most conservation measures were a waste of time, and that the species extinction would continue unabated under the current system of planetary management. It has. Since I started writing on population and the environment (in 1993 or 1994), my view has been that industrial society is doomed – that all world leaders are striving for more and more industrial development and activity, regardless of the cost to the environment or the risk that it poses to future generations of mankind and other species. Nothing has changed in this regard.

The most popular piece on my website at the present time is *It's the Oil, Stupid!*. I wrote this article last August – September, i.e., over a year ago. In the time since then, events have not diminished the validity of my views in the matter of Iraq (which, as I noted in my article, are simply applications of time-tested views of others, such as Sun Tzu, Machiavelli, Napoleon, Liddell Hart and others).

I could cite other examples of my opinions / predictions and their over-time validity. Some of my predictions have not yet had time to materialize (e.g., a suitcase nuclear bomb on an American city, or the catastrophic collapse of Western industrialized society). The point that I am making is to look at my work as a whole, from the time that I started writing, and assess whether you agree that my views have stood the test of time. This, perhaps, is the best available way of assessing “my ability to make accurate statements and not just prophecies about nature and the human relationship to the environment.”

My approach to planetary management

I should point out that, in addition to the occasional predictions that I have presented on my website, I have a great deal of experience in statistical forecasting. In 1970, before the publication of G. E. P. Box' and Gwilym M. Jenkins' classic text, *Time Series Analysis, Forecasting and Control*, I developed and marketed the first commercially available general-purpose Box-Jenkins forecasting computer program package.

As a statistician who has worked much in time-series analysis, forecasting, and game theory, I am often involved in making predictions, none of which will come true exactly. The best that can be done in many real-world situations is to estimate the likelihood of alternative futures, e.g., by specifying a probability distribution over a set of possible outcomes. As a person who

has spent much of his life dealing with uncertainty, inference, estimation, and the development of strategies, I am well aware that, in significant areas, the future is unlikely ever to come true exactly as anyone predicts, especially in an uncontrolled environment. It is very important to realize that we are involved in a game – the game of life – and that this game has many players with many different value systems and objectives. Prediction of outcomes is more appropriate in non-game contexts. In game contexts, it is important to recognize that the outcome may be very difficult to predict (it will depend on who “wins” the game), and the best that can be done is to identify a good goal (relative to one’s value system) and to develop a strategy that is likely to work well to achieve that goal. This is the approach used in my book, *Can America Survive?* In that book, I addressed mainly the issue of identifying a useful goal. I did not (in the book) go so far as to formulate the problem as a mathematical game, but I did employ a decision-theoretic criterion as the basis for my proposal that a “minimal-regret” population be considered as a desirable goal. In that book, I did not present material on how to “play the game” to achieve the goal of bringing about a minimal-regret population (I am still working on that, now!).

In my view, it is very important to view the Earth as a *controllable system*. At the present time, the actions of world leaders are directed toward destroying its biosphere and increasing the likelihood of human extinction. The point is that human activity is making macroscopic changes in the planet’s biosphere (mass extinction of species, killing of lakes and seas, global warming (e.g., melting of ice packs), deforestation, desertification, destocking of seas). One thing to keep in mind, however, is that Earth is a *natural biological* system, and mankind is totally incompetent to assert *active* control over it. The best that man can do is to “back off,” and let Nature do its work, i.e., he can assert *passive* control. That is, the best method of control of the natural environment is to maintain such a low profile in the

environment that Nature can do its amazing work the way it always has. (I have made this point many times in the past. Recently, it was emphasized on a website that summarized *Can America Survive?*. On its front page for October 17, The *Deconsumption Reading Room* wrote: “Here is the most extensive and well-referenced treatise I’ve found on the coming ‘population adjustment.’ In fact, it’s a whole book really, with an index and several appendices. ... From my own viewpoint, our world leaders haven’t shown much responsibility or competence in the growth of our modern civilization, so I have absolutely no faith whatsoever that they would be any more capable in ‘reducing’ it. ... If I had my druthers, I’d prefer to see them forced to take a back seat, and let Nature take the wheel from here.” Right on!)

Systems engineering Is the most important tool

The most important tool in planetary management is systems engineering. Systems engineering is the discipline concerned with the development (design and implementation) of systems for performing specified functions or accomplishing specified goals. The major components of a systems engineering project are needs analysis; development of an operational concept; technology review; requirements analysis; functional analysis; specification of evaluation criteria; synthesis of alternative system designs; evaluation of alternatives with respect to the criteria; selection of a preferred alternative; top-level design; detailed design; prototyping; optimization; implementation; and test. The truly creative part of systems engineering is the synthesis of alternatives. Some people have a lot of talent in this area, others do not. Creative skill can be enhanced by experience, practice, discussion with others, contemplation, meditation, autosuggestion, and reading. The design and development of the system may embrace a wide range of disciplines, including all of the basic sciences and engineering fields as well as specialized

technical skills such as statistics (e.g., simulation and modeling; estimation, prediction and control of stochastic processes; experimental design; evolutionary operation; statistical decision theory); operations research (e.g., optimization, game theory, artificial intelligence, fuzzy logic), and control theory (system identification; system control). Systems engineering may be applied to any field. As an example of a systems engineering application, see my book, *The Value-Added Tax*, where I used systems engineering to develop a new tax system for the United States.

In systems engineering, knowledge of many fields is important

In order to develop a good strategy for controlling any system, it is necessary to know a lot about the system. The Earth's biosphere is a complex system – too complex to be amenable to control by physical man. What *is* feasible to control, however, is the human population. In order to do so effectively, it is necessary to have knowledge of many fields, spanning all bodies of knowledge – including both the 'hard' (objective-oriented) sciences and the 'soft' (subjective-oriented, social) sciences. The hard sciences include mathematics, physics, chemistry, biology and many combinations of these, such as agriculture, geology, computer science, communications, oceanography and the like. The soft / social sciences include history, politics, economics, philosophy, metaphysics, sociology, education, psychology and the like. And, of course, there are many application areas that combine elements from both hard and soft sciences, such as all types of engineering, military science, information technology, "business," and medicine.

In my own case, I have experience in a broad range of technical and nontechnical fields, and a wide variety of applications areas. I have a BS in mathematics and a PhD in mathematical statistics

(dissertation in information theory / coding theory). I have formal education in all of the basic hard sciences (mathematics, physics, chemistry, biology) and a number of social sciences (economics, psychology, philosophy, languages). Much of my professional career has been spent as a statistician and an operations researcher / systems analyst. My lifetime career has exposed me to a wide variety of technical (analytical) methodologies and substantive (application) areas. In my career, I have worked in a wide range of application areas, including defense; health; education; welfare; economics; economic development; civil rights; international trade; public finance; tax policy analysis; agriculture; banking (commercial banking and central banking); information technology; vocational rehabilitation; transportation; planning, evaluation and analysis of public programs; industry; commerce; textiles; pharmaceuticals; test and evaluation of military communication systems; information theory and coding theory; research; teaching (professor of statistics); consulting; and management.

Two fields that are particularly important with respect to achieving a desired planetary management system are education and psychology.

The development of anything new will always build on previous knowledge. Apart from tapping in to the universal consciousness, there are four main ways of acquiring knowledge: formal education; informal study (including private study and short courses); experience (including life experience, vocational experience, and learning from others); and reading. I place a tremendous value on formal education, and strove to get the best education that I possibly could. My BS degree in mathematics is from a fine university – Carnegie-Mellon University in Pittsburgh. My PhD degree is from the oldest and largest department of mathematical statistics in the world – the University of North Carolina at Chapel Hill. In my doctoral program, I studied under

Professor Raj Chandra Bose, the “father” of experimental design, and developer of the Bose-Chaudhuri-Hocquenguem (BCH) error-correcting codes. Among his other distinctions, Prof. Bose solved one of Euler’s long-standing conjectures. In my doctoral program, I specialized in experimental design / Galois fields / finite geometries, and in my doctoral dissertation, I developed what are still the best class of codes for correcting both additive and synchronization errors in noisy communication channels.

By means of informal study, I have expanded my knowledge far beyond my formal education. This has enabled me to work as a consultant and researcher in many fields. My knowledge of game theory, lagrangian optimization, sample survey design and analysis, time series analysis, database design, systems and software engineering, public finance, Spanish, and the guitar were all acquired after I completed my formal education.

I am a voracious reader. I have a personal library of thousands of books on a wide variety of technical and nontechnical subjects. Whenever I become involved in a new subject, I usually purchase dozens of books (sometimes hundreds of books) on the subject. (I make some use of libraries, particularly if I am near a major university, but generally I find that large bookstores and Internet bookstores such as Amazon and Barnes and Noble have a vastly larger variety of sources on most subjects that I am interested in.)

Other useful skills: game theory, education, strategic planning, and psychology

The main point of the articles posted on my website is to motivate and create an enabling environment for rational (sane) planetary management. The goal of rational planetary management is to control Earth’s biosphere (or, more correctly, assure that we do not interfere with its normal operation) so as to preserve it and keep the likelihood of mankind’s untimely extinction extremely

low. The central focus of my activities is the development of strategies to bring this about. My view (conceptualization, abstraction, idealized representation) of the world is a very large game (many players over a long time) or control system, and my goal is to develop strategies for ensuring that the game moves to a configuration (state) that I desire (viz., a long-term-sustainable system, with a stable, largely preserved biosphere and extant human population). Given my focus and viewpoint / perspective, the most important area of my qualification, apart from systems engineering, is game theory (and related areas such as statistical decision theory, optimization and control). Other important areas are education (a primary purpose of my website), strategic analysis and planning, and psychology (used in a broad sense, to include a wide range of intellectual, mental, emotional and spiritual areas). Given the importance of this area, scrutiny of my qualifications should focus on my capabilities in game theory, education, psychology and related areas.

My skills in game theory

In the field of game theory, I have some significant accomplishments. This includes the development of optimal procedures for waging large-scale missile warfare, and the development of practical (numerical) procedures for solving general-sum (nonzero-sum) games. My paper, *Subtractive Overlapping-Island Defense with Imperfect Interceptors*, develops a strategy for waging large-scale missile warfare. With respect to the problem of solving general-sum games, I will note the following. The theory of nonzero-sum games was developed mainly by Professor John Nash, the subject of the book and movie, *A Beautiful Mind*. Nash developed an elegant solution to nonzero-sum games. It is called the “bargaining solution,” or the “Nash equilibrium.” The only problem with Nash’s solution is that it is not explicit – his proposed solution is “nonconstructive.” He describes the properties of a good solution, but he does not tell

how to actually find it. It is similar to the problem in zero-sum (or constant-sum) games – the optimal solution is known to be at a “saddle point,” but the main difficulty is actually finding that point. The problem is complicated very much when constraints (such as resource constraints) are added to it. In my paper, *Conflict, Negotiation and General-Sum Game Theory*, I develop an approximate methodology for determining explicit solutions for Nash’s bargaining solution.

On the practical side, I might add, somewhat tongue-in-cheek, that I enjoy playing games very much. In high school, I was a creditable chess player. While a member of the Lambda poker club (successor to the IDA/WSEG poker club), I held my own against some of the best technical minds in the world (e.g., Hugh Everett), at one time winning for thirteen games (monthly meetings) in a row.

My skills in education

In the realm of education, I will note that, in my graduate education I was trained to be a researcher and professor. The Statistics Department at Chapel Hill was theoretical. I selected this department (out of the 21 statistics departments that existed in the US in 1961, when I was looking at graduate schools) because I have a strong desire for mathematical rigor – I want to understand what I am doing as deeply as I can. I did well in my graduate studies, and was the first in my “class” of 1962 to be awarded the PhD degree (in 1966). Although I enjoy mathematical rigor very much, and was trained to be a professor, this vocation never really appealed to me. To be very competent in a technical field, it is necessary to specialize in it and devote most of your time to it. I enjoyed information theory, coding theory, and mathematical statistics very much, but I did not envision myself spending my life as a researcher in these fields (or any other single, specialized field). For this reason I left

academia as soon as I completed my PhD program, and entered the world of consulting.

At one point in my professional career, however, I did some teaching, serving as an adjunct professor of statistics at the University of Arizona in Tucson, Arizona. At the risk of being immodest, I did quite well at it. One of the courses that I taught was the required undergraduate statistics course for all students of business, public administration, and management information systems (the other was a graduate course in sample survey design and analysis). The classes were quite large – I taught two sessions of 250 students each (I gave the lectures and set the examinations; I had five teaching assistants who discussed homework in small classes). At the U of A, all professors are evaluated by their students at the end of each semester. An overwhelming percentage of my students rated me as “One of the best,” “Excellent,” or “Good.” Following are a sample of written comments from students, on the evaluation forms:

Dr. Caldwell is an excellent lecturer.

Very well prepared. I liked the way he summarized what we did in the previous class at the beginning of each class.

Caldwell gave very good examples; he made a hard course easier to understand.

Always prepared. Very thorough examinations. Summary at beginning of class.

Instructor was very clear and cared about his teaching..

He understood and explained material well.

Very fluent and he was well prepared for class meetings, reasonable reviews.

Gave good examples which prepared me very well for tests.

Very well prepared, always on time. Very good, organized teacher.

Did a good job in explaining and presenting his lecture.

Instructor was always prepared for calss and gives very good explanations about the subject.

Well prepared, easy to understand (good speaking voice and delivery).

Organized, brings material across very well. One of the best instructors at the U of A.

The instructor is very good. He is easy to understand and gives good examples of the concepts.

Mr. Caldwell gives clear explanations to the problems. I feel as though he is an excellent instructor. He is also very polite.

He was always enthusiastic about teaching. Gave clear lectures of difficult-to-understand material.

The instructor had a well organized presentation.

He did a good job explaining difficult concepts.

I liked this course! Very interesting.

Mr. Caldwell was very prepared and understandable. I would recommend other students to have him as a teacher.

In addition to university teaching, I developed and marketed a popular commercial short-course entitled, Sample Survey Design and Analysis, which I presented in various cities and to the Bureau of Labor Statistics of the US Bureau of the Census.

In summary, I have demonstrated skills in education – a primary ingredient in the mission of preparing the planet for a minimal-regret population.

My skills in strategic planning

I have spent a considerable portion of my career in the area of strategic planning. Much of this was in the area of ballistic missile warfare. In this application area, my approach was to develop a mathematical representation, or model, of the real world, and derive strategies that were optimal with respect to the model. More specifically, I formulated missile warfare as a resource-constrained game (zero-sum or general-sum, depending on the

application), and used the Everett-Pugh Generalized Lagrange Multiplier (GLM) methodology to determine a solution.

In most realistic games, the players employ randomized strategies. They are aware of the resources available to the enemy, but not of his strategy for employment or deployment of his resources.

In addition to strategic planning, I have directed projects in modeling of tactical warfare (e.g., tactical air warfare in theater-level operations). I have also developed and exercised war-game models, and participated in war gaming exercises (at the Naval War College).

My skills in psychology (in the broad sense)

One of the important areas in effecting change from our current planetary management system to a rational one is that of psychology. As I indicated above, I use this term loosely to include a wide range of intellectual, mental, emotional, and spiritual areas. If the global population is to be mobilized to support a move to a minimal-regret population (or other) system, it will be necessary not only to educate them in the benefits of this approach, but to motivate them to act to bring it about and maintain it. As a professional teacher (professor), I have demonstrated skills in education and in motivating students to learn. With respect to the motivation of global populations to change, I have essentially no direct experience. I have fairly wide knowledge of many areas dealing with the mind, such as motivation, religion, meditation, philosophy, and spirituality, but I am not a political or religious leader.

Given the stranglehold that the current global economic system has on the world, and the hypnotic attraction of most people to increased material welfare and more industrial production, it will

take a considerable effort in the area of mass psychology to bring about meaningful change on a large scale. We are currently engaged in a massive program of psychological warfare; to prevail in this struggle, it will be necessary to engage the enemy fully. The world's population has been convinced that improvements in material welfare are all that matters. But, under the current system of planetary management, more people live in squalor, poverty and disease every year. They are being told that their standard of living can be improved. But this requires living space and a healthy biosphere, and for six billion people (Earth's current population), a massive increase in the amount of commercial energy. Be we have run out of space, our biosphere is being destroyed, and we are about to run out of oil. The standard of living for the world's masses, as bad as it presently is, is about to fall drastically in the very near future.

With the advent of a war of terror, people are kept in a constant state of fear and insecurity. They are in the process of trading their freedom for a promise of restored security, safety, and survival and they will soon have none of these. The situation is *exactly* as described by George Orwell in his prophetic 1948 novel, *1984*, with daily television broadcasts of violence and war at the gates of the empire. See, in particular, section entitled *The Theory and Practice of Oligarchical Collectivism*, by the fictional author Emmanuel Goldstein, which closes with the following paragraph:

“The war, therefore, if we judge it by the standards of previous wars, is merely an imposture. It is like the battles between certain ruminant animals whose horns are set at such an angle that they are incapable of hurting one another. But though it is unreal it is not meaningless. It eats up the surplus of consumable goods, and it helps to preserve the special mental atmosphere that a hierarchical society needs. War, it will be seen, is now a purely internal affair. In the past, the ruling groups of all countries,

although they might recognize their common interest and therefore limit the destructiveness of war, did fight against one another, and the victor always plundered the vanquished. In our own day they are not fighting against one another at all. The war is waged by each ruling group against its own subjects, and the object of the war is not to make or prevent conquests of territory, but to keep the structure of society intact. The very word 'war', therefore, has become misleading. It would probably be accurate to say that by becoming continuous war has ceased to exist. The peculiar pressure that it exerted on human beings between the Neolithic Age and the early twentieth century has disappeared and been replaced by something quite different. The effect would be much the same if the three super-states, instead of fighting one another, should agree to live in perpetual peace, each inviolate within its own boundaries. For in that case each would still be a self-contained universe, freed for ever from the sobering influence of external danger. A peace that was truly permanent would be the same as a permanent war. This -- although the vast majority of Party members understand it only in a shallower sense -- is the inner meaning of the Party slogan: War is Peace." (For the complete text of *The Theory and Practice of Oligarchical Collectivism*, see the SynEarth website for 9 September 2004, <http://solutions.synearth.net/2004/09/09> .

The people are being told that the United Nations, the World Bank, the International Monetary Fund, and the World Trade Organization will solve the world's economic and social problems, and bring freedom from want and disease – even prosperity – for all. But these agencies have accomplished nothing. Compared to fifty years ago, when they began their missions in earnest, billions more people have lost their freedom, their land, their health, and their livelihoods, and they are living meaningless, desperate lives in squalor and disease. In order to achieve a rational planetary management system, it will be necessary to

expose all of these lies for what they are, and show people the way to a better, healthier planet and a better life for mankind.

A global mind-shift, or “paradigm-shift,” such as a religious reawakening or global transcendental experience, may well be required. This is unlikely to happen by itself, but rather as the result of a catastrophic event – or a committed, focused and persistent effort to bring about meaningful change. This I will leave to others – my primary role is analysis and education, not organization, mobilization and implementation.

My current activities

In my view, the solution to the world’s environmental crisis will involve spirituality and religion, as well as specialized knowledge, will, desire, and action. To this end, I have at times contemplated direct action in politics and religion, but these efforts have not “gotten off the ground.” I established the Church of Nature (see <http://www.foundationwebsite.org>) dedicated to resolution of the environmental problem, and on two occasions contemplated going into politics in the US (but abandoning these plans on both occasions when I accepted overseas assignments – see <http://www.foundationwebsite.org/Platform.htm> (2001 platform) or <http://www.foundationwebsite.org/PositionStatement.htm> (2004 platform) for my domestic political views (archived versions with modified hyperlinks)). (The main problem that I have at present is lack of time. I do not really lack resources – I have never asked for or received financial contributions from anyone to underwrite my planetary management work, and I do all of it my spare time, using my own resources.) At the present time, it appears that my efforts will continue to be restricted to educational efforts on my Internet website, rather than in direct political, religious or spiritual action of some sort, or in traditional education or research and development via a brick-and-mortar institution of some kind. (As long as my efforts are restricted to the Internet, negligible

expense is involved. I have been asked more than once, however, to produce my works in hardcopy, in order to reach a larger audience. If and when I see that I am no longer able to be effective using solely the internet, I may do so, and at that time I may have a need to tap additional resources.)

Although progress, on a part-time level-of-effort, is slow, it has been steady. The *Foundation* website now receives thousands of visitors and hits every month, and traffic to the site continues to grow year by year. I don't get a lot of e-mail from readers, but all that I do is either sincere inquiry or very positive commentary.

One of the advantages of working overseas, as I have been doing for much of the last decade or so, is that I have much more time to work on planetary management than if I were back in the US. While the pace of my work may be slow, it takes time to consider things well, and develop good plans. The past ten years, since 1993-4 when I began to work in this area, have moved slowly, but they have moved well. I often reflect that even if I could devote myself full-time to planetary management, I could probably not think things out much faster, or accomplish more.

The move to rational planetary management will not occur until conditions are right. In 1950, no one was interested in the least in rational planetary management – the global environmental crisis was just beginning to manifest. At the present time, prior to sliding down the back side of Hubbert's Curve, the planet is in the stranglehold of a powerful global economic / industrial system. But this system thrives on the energy from oil, and global oil production is about to peak. (There is a lot more coal, but coal is a poor substitute, in today's modern industrial society, for versatile oil.) Very soon, things will begin to change drastically, and for the worse, and the world will be receptive to change.

Things will probably not “start to pop” until Hubbert’s Peak is clearly manifest, and global oil production begins a noticeable decline – that’s really when all hell breaks loose. (The Peak will probably not be well-defined, but rather “fuzzy,” because of random fluctuations in supply and demand. The Peak was not expected to occur in 1993-4, when I began work on planetary management. It *is* expected to occur in this decade. It is probably occurring right now (i.e., we are likely in the middle of the part of Hubbert’s Curve which, when “smoothed” a few years from now, will clearly be seen to be the Peak.) Our times, over the next few years, are going to be the most exciting in the history of the world.

A note on character, independence and motivation

In examining the characteristics of a person as a quick means of conducting an *ad hominem* assessment of his views or works, it is important to consider his character, independence and motivation. (This reveals further the problem with *ad hominem* appeals – you can never actually prove anything about the truth of the person’s assertions, no matter how much you know about the person. More is never enough. Knowledge of the condition or nature or abilities of the man will never be a substitute for a scientific assessment of the validity of what he says. While testimony from expert witnesses may be accepted in courts of law, it can never serve as a satisfactory means of assessing the truth in something that really matters (like the fate of mankind and the biosphere).) From a legal viewpoint, my reputation is sound – I have never been convicted of any crime. With respect to the independence of my views, I will comment that I have worked almost my entire career as a consultant. Early in my career I worked with large consulting firms, such as Research Triangle Institute, Planning Research Corporation, Lambda Corporation / General Research Corporation, and Bell Technical Operations. Mid-career, I either ran my own contract research firm (Vista Research Corporation)

or served as an independent (freelance) consultant for a number of clients. Since 1991 (the past 13 years) I have served as a freelance independent consultant, working for clients such as the Bank of Botswana, the US Agency for International Development, and Canada Trust, either as a direct-contract employee (such as the Bank of Botswana) or a consulting-firm intermediary (such as my current USAID work through the consultancy Academy for Educational Development). I once served as an expert witness (statistician) for a law firm in a trial in Tucson, Arizona, dealing with prices received by Mexican farmers for their produce sold in the United States.

While I am not independently wealthy and therefore unable to work on planetary management full time, I make a good living, and I have been able to work at it for extensive periods of time between long-term consulting assignments. I have never received a grant to work on planetary management, and so I am beholden to no one for my views. I should note that no one is funding “my kind” of rational planetary management (a global “minimal-regret” population of ten million people, consisting of a single-nation high-technology population of five million and a geographically dispersed (globally distributed) primitive (hunter-gatherer) population of five million). Since my view is that it is large human numbers and industrial activity that is destroying the biosphere, it is unlikely that I will ever receive substantial funding. Hardly anyone would consider spending the profits derived from an industrial system to point out the evils of that system and work toward its replacement. Also, given my extreme views in the matter, and my “racist, sexist, warmonger” reputation (whether deserved or not), it is probably unlikely that any environmental or other group would wish to hire me or fund me – I would probably flunk their course on gender / ethnic sensitivity!

Since my consulting practice pays me adequately, and I take pride in the independence of my views, I have no incentives to tailor my views to suit any vested interests.

Cultural background

With respect to cultural background, I was raised a Christian (Baptist / Presbyterian), and I subscribe to the philosophical views of Christianity as an ideal system of morality and social behavior (for individuals – no state could continue to exist if it “turned the other cheek”). I was born in Canada, and my family emigrated from Canada to the United States in 1953, when I was ten years old and in seventh grade. We moved to Florida for a short time (a few months) and then lived in Delaware for three years, where I attended junior-senior high school (grades 8-10). My extracurricular activity was music (trombone in high-school band and fire department band), friends, and the Boy Scouts. In 1956, we moved to South Carolina, where I attended high school (grades 11-12), and my mother still lives (father deceased). I have a younger sister (living in South Carolina) and brother (living in Atlanta). My dad was a tool-and-die maker early in his career, then a supervisor of an industrial production facility, and then a teacher of industrial arts. My mother stayed at home, and was always there for us. My childhood was varied, interesting, educational, secure from want or anxiety, and filled with love (parents, relatives, siblings). I can't say that my childhood was exceptionally exciting, but I view that as good – just growing up is excitement enough for any child, in my view.

In 1958 I received a full scholarship (General Motors College Scholarship) to attend Carnegie-Mellon University, and in 1962 I received a generous NASA fellowship to attend the University of North Carolina at Chapel Hill. In college, I majored in mathematics – there was never any question about that. My summer jobs in college included working in a shoe store, a

machine shop, and the research department of a textile firm, where I worked for a statistician, where I realized immediately that the field of mathematical statistics was the one for me.

I worked most of my early career in the US, with some overseas work in Haiti in 1975-76 and in the Philippines in 1978-81. In 1991, I started doing much more overseas work. I have worked long-term in Egypt, Malawi, Botswana and Zambia (current location), and short-term in Canada, Ghana, and Bangladesh (with some time back in the US). I have traveled to a number of countries in the Americas, Europe, Africa, Asia and Oceania. I speak Spanish and French, and know a little Arabic and German, so I can “move around” easily in many foreign countries.

My professional career has been very interesting and rewarding, and, from my viewpoint, very successful. It has provided me with the freedom and wherewithal to do virtually anything that I wanted to do (although not everything – I would need several more lifetimes for that!), and to engage in a very wide variety of experiences. From a technical viewpoint, I was able to work on and solve very challenging problems. I have had the opportunity to work with some of the world’s greatest scientists, including Hugh Everett III (one of the world’s great physicists, developer of the parallel-universe concept in physics and of the Generalized Lagrange Multiplier optimization method) and Raj Chandra Bose (one of the world’s great mathematicians, “father” of the mathematical theory of experimental design, inventor of the Bose-Chaudhuri-Hocquenguem error-correcting codes, and solver of one of Euler’s conjectures). In my overseas consulting career, I have had the opportunity to consult at the highest levels of government, working closely with governors of a central bank and participating in meetings with cabinet ministers and a president.

In brief, my culture is white Anglo-Saxon Protestant, with substantial exposure to foreign cultures. It was during my posting

in Malawi that I became sensitized to the complete destruction of the environment by large human numbers and industrialization, and decided to do something about it.

I married early and had three children. We had a rich family life, but some severe blows as well (wife dying of cancer, son paralyzed in an auto accident, another son with serious legal difficulties). My children are all grown now, and I am in a second happy marriage. Outside of work, while the children were growing up, we spent many happy vacations. I served as a scoutmaster of our church Boy Scout troop for 11 years, and occasionally participated in a community band (baritone horn). While my children were young, most of my spare time was dedicated to family activities (lawn and house care on the weekends; soccer games, track meets, swim meets and other school events; scouting; picnics and other family outings; visits to the relatives; family vacations, church activities; croquet and badminton in the back yard; gardening). Outside of family life, social life was somewhat restricted in those days, including things such as an occasional Lambda square dance and stage plays in Washington, DC. In addition to reading and writing, I “dabbled” in a variety of recreational activities, including martial arts (fencing, judo, jiu-jitsu, Tae Kwon Do) and guitar. I was a cross-country runner in college, and, for the rest of my life, every spring, I would run for about six weeks to get back in shape (until my hips started causing me trouble a few years ago). As a family, we took up snow skiing, and spent a number of winter vacations in this activity. We had fabulous vacations, at great resorts (e.g., Stowe, Killington, Jay Peak, Smugglers’ Notch, Sugarbush, Snowshoe, Vail, Snowbird, Park City, White Mountains, Flagstaff, Reno, Tahoe) and beautiful settings (Montego Bay, Jamaica; San Juan, Puerto Rico; St. Thomas and St. John, US Virgin Islands; the Philippines; Canada; Florida; Shenandoah Mountains; Myrtle Beach). At one time I owned a white-water canoe (17-foot Grumman shoe-keel), and I have canoed famous wild rivers in

Virginia, Maryland and West Virginia. I have hiked and camped the 184 miles of the C&O Canal and countless other sites of stunning scenic beauty in the Shenandoah Mountains. I have white-water rafted down the Zambezi River. I have floated down the Nile on a cruise ship, visiting ancient ruins along the way.

I have seen the world's great natural wonders (Niagara Falls, Victoria Falls, Iguazu Falls, the Grand Canyon, the Salt River Canyon, the Okavango Delta, the wild game migrations in Kenya (Amboseli, Masai Mara), Cappadocia, Karchner Caverns, Natural Bridge) and manmade wonders (the Pyramids at Giza, Luxor, the Valley of the Kings and Queens, Abu Simbel, the Parthenon, Delphi, the Coliseum in Rome, Ephesus, Aphrodite's Temple, Petra, Jeresh, the Crusader Castles, the Slave Castles (Kumasi Fort, Elmina and Cape Coast Castles) of Ghana, the ruins of Great Zimbabwe, the Eiffel Tower, Old Fort Henry, the St. Louis Arch, Notre Dame Cathedral, Salisbury Cathedral, the Kremlin, Washington National Cathedral, the Washington Monument, Stonehenge, the Statue of Liberty, the view of New York City from the top of the Empire State Building (and the World Trade Center), the pyramids and ruins of Central America, the San Francisco Bay Bridge, the Brooklyn Bridge, and the great cities of the world). I have flown all over the world in jumbo jets. My wife and I have visited many game parks and other tourist destinations, and played golf in wonderful settings around the world. I have had just about everything worthwhile that money could buy (and maybe a few not-so-worthwhile things, as well!). Education, profession, family, hobbies, excitement, adventure, the mystery of life, good health, good friends, a great country, nice homes, great vacations, cars (old cars, new cars, sports cars, family cars), clothes, books, electronic equipment, and countless other material possessions – I've had it all. Life was great. I have seen, experienced, and possessed the best that the physical universe can offer. All of this has been very exciting and interesting – not just participation in the modern world, but

participation in the science and technology that built it. Were the modern world not destroying the biosphere (and causing incredible human misery), I would like to see it continue. But it cannot continue in a world of large human numbers and large industrial production. At the present time, it is a matter of too much of a good thing. It is not science or technology that is inherently bad – knowledge is only good or bad as reflected in its applications. It is the use of it to smother the world with human beings and industrial waste that is the current problem – and that problem can be fixed.

My country and my profession served me very well. By my middle thirties, I owned a fine home in Fairfax County, a fine office building in old-town Alexandria, and condominium in the finest high-rise resort buildings in Ocean City, Maryland (English Towers), where my neighbors were the likes of Frank Perdue (of Perdue Chickens) and former Vice-President Spiro Agnew. As a family, we spent a good portion of each summer at the beach. In short, I had all that life could offer – a wonderful wife and family; an interesting, successful career; and sufficient money to purchase all of the material possessions and vacations that we desired. I have no motivation whatsoever, stemming from how it has treated me, to wish the early decline of the industrial world, which has been exceedingly good to me. The matter is simply that I see that this lifestyle, for the large numbers of people currently occupying the planet, is rapidly destroying our biosphere, and that it will not continue. We are ruining the biosphere, causing the extinction of thousands of species each year, and threatening our own extinction or relegation to a barren, ruined planet for the remainder of time. Continuing this lifestyle for this many people is not an option; the *only* meaningful consideration is deciding what system of planetary management will replace it (or letting Nature decide for us, if we do not decrease our numbers and industrial activity – and, in view of the terrible damage we have inflicted, she will not be kind to us).

My birth country (Canada) and my adopted country (USA) have treated me very well. America is truly the land of opportunity; I have had the opportunity to realize my desires and aspirations to the fullest. I am saddened, however, that both Canada and the US are committing cultural and environmental suicide by means of mass immigration. If I get the chance, I intend to run for Congress some day (if I am back in the US before I am too old), and help change things for the better.

In summary, I have sufficient wherewithal to be independent in my views, and no financial incentive or other motivation to influence my views. At present, I am working on a USAID-funded project to develop a management information system for the Zambia Ministry of Education. My background and work experience have been varied, challenging, and interesting, and there has been no single extraordinary event or experience that has had a profound influence on my (planetary management) views. My primary motivation is that I have looked at the situation (mankind's dramatic destruction of his very home), seen that it is very stupid and very wrong, and decided to do something about it. With my varied career (statistics, operations research, systems engineering, applied to many fields), I have a wide variety of skills and experience with which to address the problem. The only real issue is how. For insight on that, you may be interested to read my piece, *The Good Life* ("a life inspired by desire, guided by love, and facilitated (enabled) by knowledge").

Some closing remarks on the importance and role of predictions about coming world events

Since much of what I write about deals with the future, it can be characterized or represented as "prophecy." My goal is to develop strategies to bring about a long-term-sustainable planetary management system, and my main "prophecy" is that

that goal will be realized. Additional to that, however, I do make a number of predictions about what may happen along the way – on the path – to achievement of that goal, and that should be taken into account during the course of strategic planning and actual play of the game. In some cases, these are events that, in my view, are likely to happen, whether they are likely to have a serious impact on the outcome or not. At the other extreme, they are contingencies that may be very unlikely, but would have a major impact on the outcome.

As I mentioned earlier, these predictions involve events such as collapse of the global industrial system, or global nuclear war. That global oil reserves are exhausting is a fact. About the only thing to predict about it is when the peak will occur, and how long the process of exhaustion of reserves will take. The more interesting predictions in this regard are what may happen or is likely to happen as that takes place. Once again, since we are dealing with a dynamic system over which we have some control, attention should center more on strategies for dealing with that event when and as it happens, than in predictions about what might happen if no positive control is exercised. The importance of predictions, in this context, is to identify planning contingencies. It does not really matter very much whether they come true or not. What is important is that they be recognized in advance as possibilities, so that contingency plans may be adopted to enable fast, effective response when and if they occur.

The situation is similar to that in military planning, wargaming, business continuity planning, and disaster recovery planning. The US military, for example, has contingency plans available to invade almost any country in the world. Most of these will never be exercised. But if it becomes necessary, for example, to invade Angola, then we can move quickly to do it – we have thought about it in advance, synthesized and analyzed options, and planned an effective response in light of anticipated

contingencies. The targets for our ballistic missiles can be “reprogrammed” on a moment’s notice, if, for example, it is decided to strike India instead of China. Recall the scene in Stanley Kubrick’s classic movie, *Dr. Strangelove*, in which the pilot (played by Slim Pickens) of a nuclear-armed long-range bomber over Russia realizes that he is losing fuel and cannot reach his primary target. It’s no big deal. He simply reaches for a contingency plan, and proceeds (successfully) on to his secondary target. The purpose of wargaming exercises is to determine how good our response will be in the face of certain situations, including not only high-likelihood situations but also unexpected and unusual situations, to train our personnel in being able to deal with these situations, and to improve the system to handle situations that expose weaknesses. (In addition to considerable experience with war-game models, I also have experience in business continuity planning / disaster recovery planning. As Director of Management Systems for the central bank of Botswana, I directed their Year 2000 program and the development of business continuity plans / disaster recovery plans for the Bank.)

It should be recognized that I place rather little importance on whether the events that I predict may happen along the way to achievement of the goal of a rational planetary management system. All of the events, significant or otherwise, that may happen along the way are simply contingencies. As they occur, they simply make the game more interesting and exciting, but they will not affect the final outcome. The focus of attention in establishing a rational planetary management system should be on strategies for playing this multi-player time-sequential game, no matter what events occur along the way. Prediction of what particular events may occur is difficult to do with much accuracy, but it doesn’t really matter. What is important is to anticipate a full range of contingencies, and to have contingency plans developed so that as these anticipated events happen, “our side” of the

game can respond quickly and effectively, and move the game expeditiously and confidently on to the final desired state. What is even more important is to have a gaming system in place that works well in the face of *unanticipated* events. Hubbert's Peak may occur this year, or it may not. The mass species extinction may continue, or it may not. Suitcase nuclear bombs may be placed on 1,000 of the world's largest cities, or they may not. None of this really matters. Some of these events (such as Hubbert's Peak) are virtually certain to occur, whereas some (such as a "suitcase-bomb" global nuclear war) may not occur at all. What matters is that, as the significant events of the future unfold, whatever they may be, we are able to take full allowance of them to move the state of the world's planetary management system, and hence the state of the world, to the desired goal. Management is the ability to monitor and control, and respond effectively to change, and good management – leadership – is the ability to respond to unanticipated change. To be able to effectively address unforeseen contingencies, it is important to have a strong management / leadership process in place, to have demonstrated skills in tactical warfare, to understand the situation fully, and to keep the eye on the target, the goal, of establishing a rational planetary management system.

To assess my abilities and the validity of my views, the main thing to focus on is the logic underlying my predictions (including the methodologies employed, the correctness of the data / facts / premises, and the reasonableness of my assumptions). Second, take a look at whether my observations, without revision, have stood the test of time. And finally, as requested by my e-mail correspondent, take a look at my credentials, qualifications, and experience in the field of strategic analysis and related fields. Examine my technical papers (e.g., *Synchronizable Error-Correcting Codes*; *Conflict, Negotiation and General-Sum Game Theory*; *Subtractive Overlapping-Island Defense*, and *The Value-Added Tax*), and assess their correctness, creativeness, and

level-of-difficulty. Contact my previous employers, clients, and colleagues and ask them for their opinion of my work. With respect to specific positions and jobs, I have spent a career in technical work (operations research, statistics, systems analysis, systems and software engineering, optimization, game theory, and the like, in many applications areas (e.g., defense, health, education, welfare, public finance, economic development, industry, banking). Following are three résumés (military, business, economic development) that describe some of my background and experience (contact information deleted).

In closing, I will remark that what qualifies me to make accurate assessments and not just prophecies about nature and mankind's relationship to the environment is my determination and skill in playing the game of life. Throughout my life, although there are certainly events over which I have no control, I have been able to achieve all of my major life objectives (education, family, career, avocations (e.g., music, guitar, languages, world travel)). At this stage of my life, my fervent goal is to bring about the eventual establishment of a rational planetary management system, or, if my life is not sufficiently long to see the materialization of such a system, to arrange things, to set things in motion, (via education and organization) so that this goal is eventually achieved. I intend to succeed.

I rather view the issue of prophesying the eventual state of the world as similar to the problem of predicting where an arrow will be at a future time. If you don't tell me anything about the arrow or its context, I can't really tell you very much at all about where it will be in the future. But if you tell me that it is an arrow in Howard Hill's quiver, and that he is in an archery contest, I will predict that the arrow will soon be in the bull's-eye of a target. (For the younger generation: Howard Hill, who died in 1975, was the greatest archer of the twentieth century.) The issue is whether what we are dealing with is a random, uncontrolled system, or a

system under positive control. If someone asks you to predict where your neighbor's car will be next Saturday night, you may or may not be able to predict this with much accuracy. If you are asked to predict where your car will be next Saturday night, then you have an excellent chance of being correct in this "prophecy," since you are in control of the car. External events might occur (you might die of a heart attack the day before, or your car may be stolen), but, odds are, you will be able to make the prophecy come true. At the present time, the world is moving helter-skelter toward ecological ruin and the extinction of mankind. At some point, enlightened people who care about the future will take charge, and move to realize a better future. Why? Because the alternative is ruin or death, and I don't see that as a rational choice, or a spiritual choice.

Whether I am able to see the implementation of a rational planetary system does not bother me at all. All that I can do is the best that I can, given my knowledge and capabilities. Moses never reached the Promised Land, and John the Baptist did not live to participate in Christ's mission. Achieving a rational planetary management system is a tremendous undertaking, and it will not be accomplished by a single person overnight. I am reminded of the role of Hari Seldon, the psychohistorian in Isaac Asimov's classic science-fiction series, *Foundation*. He conducted his analysis of the situation and set his plans in motion centuries before the fall of the Galactic Empire took place.

I was watching a movie the other evening called *The Dish*, starring Sam Neill. It was about events at Parkes Radio Telescope / Observatory during the Apollo moon landing in 1969. At one point, when advising a young fellow to be more aggressive in approaching a young lady, Neill made the following remark: "Failure is never quite so frightening as regret." If, even in the face of incredible odds, we try to save the planet and fail, then we can still take pride in our efforts (as St. Paul remarked, "I have

fought the fight, I have run the course, I am finished.”). If we don’t even try, we will surely lose, and our successors, if any, will endure millennia of regret on a ruined planet. Life rewards action. The time is drawing near in which positive action will be required. Let us not fail to meet the challenge.

Epilogue

If you have read this far, congratulations – you are certainly persistent. There was a reason for my very over-long discussion of my credentials. At this point, I hope that you realize the hopelessness of evaluating someone’s work on an *ad hominem* basis. You now know a lot about me relative to my work and motivations relative to planetary management, but, despite all of this information about me, you still don’t know anything more about the validity of my views on that subject. At best, a person’s reputation may tempt you to read his material (just as you may be inclined to read another book of an author you enjoyed, or a movie director whose previous films you enjoyed), and I hope that this is the case here. But his credentials have no bearing on the truth or validity or utility of what he says.

It is the same as with revelation in religion. No matter how real or true or incredible a spiritual experience or revelation may be to someone, it is still entirely subjective, and, without further analysis, sheds no light on the nature of things in the physical world (of our five senses). (It certainly sheds light on things in the *spiritual* world, since it is in fact real in that world.) A revelation, just as a dream or hunch or spontaneous idea, may be very useful as an hypothesis, or in suggesting a course of investigation, or in drawing attention to a philosophy, but the establishment of the truth or validity or utility of the revelation with respect to the physical universe must be determined, using the scientific method, in the physical universe.

A speaker may have great charisma, but charisma gets you just so far – he must have something significant to say. Charisma may get the attention of his audience, but only the content of his message will continue to keep the audience's attention.

It is my sincere belief that, because of my natural talents and abilities and the knowledge and skills (and experience) that I have acquired through life, I correctly understand the nature of the environmental dilemma facing mankind, and I have identified some potential solutions that deserve consideration. I am by nature a rather private person – most of my early writings were first released using a pen name (perhaps *nom de guerre* is the better word here). It was at the insistence of a friend that I started using my real name on my environmental and socio-political publications. Until now, I never bothered to elaborate on my credentials and background on my website, not just because I am a private person, but more so because I thought that they were largely irrelevant. If a review of my credentials motivates additional people to read what I have to say and consider it, however, then that information will have served a useful purpose, and to that end it is gladly shared.

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- o test and evaluation (communications-electronics, C⁴IEW)
- o statistical applications (test design, data analysis, statistical methodology, survey design)
- o scientific programming (statistics, optimization, graphics; expert systems, spatial analysis)
- o operations research and statistics

- o geographic information systems, mapping information systems
- o programming languages / development environments / tools / mathematical software packages: C, FORTRAN, Visual Basic, MS-DOS/Windows, UNIX, SAS, SPSS, Statistica, dBASE/FoxPro/Access, SQL, ArcView GIS, MATLAB, Numerical Recipes, many others
- o standards: ISO 9000 Quality Management; ISO 12207 Information Technology; DOD-STD-2167A, MIL-STD-498 Software Development; Carnegie Mellon University Software Engineering Institute Capability Maturity Model (SEI CMM)

Manager of contract research / system development firm (seven years); successful bidder on numerous technical contracts, including four Small Business Innovation Research (SBIR) contracts. Manager of R&D department of major US Army test and evaluation center. Director of more than twenty projects.

Chief information officer of the central bank of Botswana. Set IT vision, strategy, policy, procedures; supervised all IT operations. Supervised Year 2000 project and bankwide disaster recovery project.

Professor of Statistics at the University of Arizona, Tucson, Arizona

Developer of technical seminars and computer program packages in defense applications, sample survey, forecasting, and geographic information systems

Languages: Spanish, French; limited German; "street" Arabic; native in English

Summary of Experience. Dr. Caldwell's professional career in systems analysis, system development, research and management has centered on the use of modern analysis

techniques to solve practical problems in government, commercial, industrial, and defense applications. His career includes founder and manager of Vista Research Corporation, manager of the R&D Department and Principal Scientist of the US Army Electronic Proving Ground's Electromagnetic Environmental Test Facility, and consultant or employee to major contract firms (Bell Technical Operations, SINGER Systems and Software Engineering, General Research Corporation, Planning Research Corporation, Research Triangle Institute).

Current address: [deleted]

SUMMARY OF WORK IN MISSILE DEFENSE. The following paragraphs summarize work in ballistic missile defense and related areas.

Derivation of Optimal Ballistic Missile Area Defense. Derived the optimal solution to the problem of allocating imperfect (less than perfect reliability) area interceptors to defense sites. This problem is technically referred to as "subtractive overlapping-island defense with imperfect interceptors." It is technically difficult because it is a two-sided optimization problem (a resource-constrained game) involving a "nonlinear, noncontinuous, nonconvex payoff function." The solution to this problem is necessary to compare alternative ballistic missile defense system configurations, and to make decisions about sizing and allocation of interceptor stockpiles. This work is described in the report, *Subtractive Overlapping-Island Defense with Imperfect Interceptors*, US Arms Control and Disarmament Agency Report ACDA/ST-166.

Derivation of Optimal Ballistic Missile Point (Local) Defense. Derived the optimal solution to the problem of allocating imperfect point-defense (hardsite defense) interceptors to local defense sites. As in the case of area interceptors, this problem is technically difficult to solve, since it involves nonconvex,

noncontinuous payoff functions. This solution is needed to compare alternative defense configurations in the case of point defense (e.g., defense of an isolated radar facility, or a target of such importance that its interceptors would not be used to defend alternative targets). This work is described in the report, *Some Problems in Ballistic Missile Defense Involving Radar Attacks and Imperfect Interceptors*, US Arms Control and Disarmament Agency Report ACDA/ST-145.

Hardsite Defense Model. Developed the HARDSITE computer model to analyze ballistic missile defense systems. The model included treatment of imperfect interceptors, reprogramming of interceptors, decoy silos and sites, redundant radars, local (modular) and area defense, multiple reentry vehicles (RVs), decoy RVs, and multiple weapon types. The model determines the optimal preallocated, randomized, (min-max) defense-offense strategies, taking radars into account, and can also be used to determine the value of simple nonoptimal strategies. This work is described in the report, *HARDSITE Defense Model*, Office of the Assistant Secretary of Defense Contract DAHC15-68-C-0187.

Conflict, Negotiation, and General-Sum Game Theory. Developed a computationally tractable general-sum (non zero-sum) game-theoretic solution to war, taking into account the effect of the threat of war on negotiations (this work found a practical solution to John Nash's bargaining solution to a non zero-sum game). (Game-theoretic formulations arise in the evaluation of weapon systems since it is important to evaluate all systems when optimally deployed.) Most war gaming, weapons allocation, and force procurement models have been developed using either zero-sum payoffs (one player's loss is the other's gain), or ignoring the relationship of conflict to negotiation. This work shows how optimal strategies for the difficult mathematical problem of solving a general-sum game (which represents war better than the zero-sum formulation) can be approximated by the solution to a

particular zero-sum game derived from the general-sum game. This work is described in the report, *Conflict, Negotiation, and General-Sum Game Theory*, Office of Naval Research Contract N00014-69-C-0282.

Naval Combat Damage Model; Multiple Resource-Constrained Game Solution. As part of a project to determine a model to assess the value of naval general-purpose forces, methods were determined for solving matrix games having multiple resource constraints. A solution was determined by combining the method of generalized lagrange multipliers and the Brown-Robinson method of fictitious play. This work is described in the papers, *Naval Combat Damage Model*, ONR Contract N00014-69-C-0282 and *Multiple Resource-Constrained Game Solution*, ONR Contract N00014-69-C-0282.

US Navy Systems Simulation Program. As part of the effort to design the Naval Satellite Ocean Surveillance System, determined methods for performing correlation/tracking and multisensor fusion of surveillance data. This work is described in the reports, *Correlation/Tracking Performance Study* and *Improvements to the Systems Simulation Program*, Navy Space Systems Activity (NAVELEX).

Evaluation of Alternative Missile Tracking Systems. For the Advanced Ballistic Missile Defense Agency, conducted a study to compare the performance of alternative missile tracking algorithms. The study centered on analysis of the performance of autoregressive integrated moving average (ARIMA, or "Box-Jenkins") models compared to the Kalman filter and alpha-beta trackers. The work is described in the report, *Box-Jenkins Filter Feasibility Study*, Advanced Ballistic Missile Defense Agency, Contract DAHC 60-71-C-0048. This work laid the groundwork for the development of the "Cassandra" tracker, a Bayesian, nonlinear missile tracker subsequently developed by G Lucas and Hugh

Everett III. (Cassandra is not only appropriate for tracking maneuvering missiles, but for identifying “turning points” in financial markets.)

CAREER SUMMARY

Management and Scientific Consultant (1974-present)

Served as independent consultant to numerous consulting firms and other organizations, including Planning Research Corporation, General Research Corporation, Bell Technical Operations, Western Research Company, Chemonics, Academy for Educational Development in systems and software engineering, system development, project and program management, management information systems, statistics, operations research, research design, program monitoring and evaluation, and strategy and policy analysis in defense and other application areas. Recent assignments include:

Management Consulting / Information Technology / Senior Management. Currently (2002-2003) serving as technical advisor to the Zambian Ministry of Education, to develop a management information system to store and retrieve data collected in the annual school census (US Agency for International Development / Academy for Educational Development). Prior to that (1999-2001), served as Director of Management Systems (chief information officer) of the Bank of Botswana (Botswana’s central bank). Applied standards-based quality management (ISO 9000 Quality Management standard, ISO 12207 Information Technology standard, DOD-STD-498 Software Development and Documentation standard, Carnegie Mellon University Software Engineering Institute Capability Maturity Model) to direct all Bank computer operations. Introduced the use of systems and software engineering tools, including the Popkin System Architect and the Computer Associates (CA) Entity Relationship for Windows

(ERwin) and Business Process for Windows (BPwin) products. Acquired the CA Unicenter TNG system management software package for monitoring and control of the bank's 300-computer system. Managed a staff of 16 information-technology (IT) professionals and 30 IT projects (annual budget \$3 million, exclusive of personnel, training, and facility). Set IT vision, mission, strategy, policy and procedures, and supervised all IT operations. Supervised Year 2000 project, IT disaster recovery project, bankwide disaster recovery project. Other recent assignments in banking include development of a system for positioning automatic teller machines (ATMs) using lagrangian optimization and the ESRI ArcView Geographic Information System (GIS) (First Union National Bank), and development of an optimal variable-rate pricing strategies for Canada Trust Bank.

Automated Receiver Operating Characteristic System; Diagnostic Imaging Systems. Conducted requirements analysis and specification for the statistical system of an automated receiver operating characteristic (ROC) system. The goal of the development effort was to develop an easy-to-use, microcomputer-based system for facilitating the design, implementation and analysis of receiver operating characteristic experiments. (A ROC experiment is an experiment designed to determine and describe the accuracy of a diagnostic system, such as a computer imaging system. The system is to make a decision about what alternative state of nature is true, based on an (image) observation. The ROC methodology lends itself well to graphical presentations on microcomputer screens, e.g., in medical diagnostic imaging systems or military multisensor fusion applications.)

Personnel Management Information System for the Government of Malawi. Developed the computer Personnel Management Information System for the Government of Malawi civil service. The system includes a variety of demographic and employment-related data for all 60,000 Malawian civil servants, and offers the

users (personnel officers) a wide range of data entry and query/report capabilities. The software includes a 30,000-line graphical user interface (GUI) to enable the user to generate a large selection of queries and reports by making point-and-click selections from a menu with a mouse. The software development was conducted in compliance with DOD-STD-2167A Software Development and Documentation standard (superseded by MIL-STD-498 and ISO 12207).

Monitoring and Evaluation of Development Projects; Management Information Systems; Geographic Information Systems. In Egypt, served as Manager of Monitoring and Evaluation for the Local Development Project, the largest local-level infrastructure development project in the world. Developed management information systems to assist the identification, monitoring, and evaluation of local infrastructure development projects. Designed and implemented a national-level sample survey to evaluate the implementation, operating, and service status of the projects. Evaluation systems made extensive use of the dBASE database management system and the SPSS statistical analysis program package. Supervised training of local planners in the use of the PC ARC/INFO geographic information system (GIS).

President, Director, Vista Research Corporation (1977-81, 1988-91)

Founded and operated contract research firm specializing in strategic and tactical analysis, simulation and modeling, program monitoring and evaluation, artificial intelligence applications, and software systems development. Winner of four Small Business Innovation Research (SBIR) contracts. Major projects include the following:

Research in Artificial Intelligence for Noncommunications Electronic Warfare Systems; Geographic Information Systems;

Expert Systems. Directed project for the Electronic Warfare / Reconnaissance, Surveillance, and Target Acquisition (EW/RSTA) division of the US Army Communications-Electronics Command (CECOM), to develop the Scenarist, a knowledge-based system to generate scenarios for use in evaluating electronic warfare systems and concepts. The Scenarist positions military units and equipment on maps using rules that take into account tactical doctrine, geographic features, friendly mission, and enemy threat. The system uses digital mapping data and is based on an object-oriented parametric representation of military units. The system, coded in C and operating on MS-DOS or UNIX-based microcomputers, contains an easy-to-use graphical user interface. The system used digital terrain data extracted from the US Army's Geographic Resources and Services (GRASS) geographic information system (GIS), and incorporates the US Army Corps of Engineers' C-Language Integrated Production System (CLIPS) expert system.

Tactical Theater Air Warfare Methodologies. Directed project for the Air Force Aeronautical System Division / Wright Aeronautical Laboratories (ASD/AFWAL) at Wright-Patterson Air Force Base, to develop an analytical theory for the generation of tactical air warfare scenarios to be used as a basis for evaluation of air warfare tactical systems and concepts. The approach involved the development of a rigorous mathematical framework for tactical combat; it incorporated elements of game theory (resource-constrained nonzero-sum games) and artificial intelligence (knowledge-based simulation).

Fast Algorithms for Real-Time Estimation, Prediction and Control. Directed project for the Office of Naval Research to investigate improved algorithms for real-time estimation, prediction and control. Improved algorithms are needed to provide a solution to a critical problem faced in both industrial and defense applications -- the fact that the algorithms used to implement

state-of-the-art statistical estimation, prediction and control techniques are too slow and failure-prone for many real-time or near-real-time applications of high interest, even using the fastest computers. Under this project, a new estimation algorithm was developed and analyzed. The algorithm, a type of "structured neural network," was demonstrated by applying it to solve multiple linear regression problems in "ill-conditioned" situations, such as the case of a singular or near-singular design matrix (multicollinearity).

Manager, R&D Department, US Army Electronic Proving Ground's Electromagnetic Environmental Test Facility (Bell Technical Operations, 1982-88)

Test and Evaluation in Communications-Electronics. Served as Manager of Research and Development and Principal Scientist of the US Army Electronic Proving Ground's (EPG's) Electromagnetic Environmental Test Facility (EMETF). Supervised the design and analysis of development tests of defense communications-electronics (C-E) systems. Directed the following projects:

- o Dynamic Electromagnetic Systems Combat Effectiveness Model. Directed project to develop measures of effectiveness for defense C-E systems and explore means of linking large-scale C-E models to large-scale tactical combat models.
- o Simulation of Realistic Electromagnetic Environment for Stress Load Testing. Directed project to demonstrate the feasibility of simulating a realistic C-E signal environment for loading the EPG Stress Loading Facility.
- o Simulation Model Architecture / Intelligence Electronic Warfare (IEW) Model Extension. Directed project to develop a

dynamic event-driven simulation model architecture for C-E test and evaluation.

- o Statistical Analysis of Voice Scoring Data. Conducted a components-of-variance analysis of data from voice scoring of data from noisy voice communications.
- o Requirements Specification for Computer-Graphics Deployment Analysis System. Supervised a systems engineering effort to develop a modern computer graphics system to interface existing EMETF communication system simulation programs.

OTHER EXPERIENCE. In addition to the preceding positions, served as a consultant or senior employee to a number of other firms. Projects supervised, directed, or contributed to include the following:

Simulation and Modeling. Directed or consulted to the development and application of numerous simulation models, including:

- o National Military Command System Support Center's QUICK General War Game Simulation Model (general wargaming model used for strategic analysis of ballistic missile defense)
- o US Navy's Systems Simulation Program (to evaluate alternative satellite surveillance systems)
- o MICROSIM Microsimulation Forecasting Model for Human Development Service Programs
- o Simulation Model to Perform Economic Evaluation of Alternative Modes of Chemical Manufacturing

Intelligence Fusion; Correlation/Tracking Developed algorithms for correlating and tracking ocean vessels using data from satellites and other sources. Algorithms involved use of statistical models to

estimate parameters of interest (e.g., location, direction, speed of ocean vessels), by combining spatial and temporal multisensor data. Developed simulation models to compare performance of alternative correlation / tracking methodologies. Methodology took into account the temporal and spatial irregularity of the data-capture technology.

Strategic Studies, Optimal Allocation, Game Theory. Directed the following studies:

- o Analysis of Hardsite Defense (Office of Assistant Secretary of Defense for Systems Analysis)
- o Nonzero Sum Game Analysis of Defense Systems (Office of Naval Research)
- o Analysis of Subtractive Overlapping-Island Ballistic Missile Defense System with Imperfect Interceptors (US Arms Control and Disarmament Agency)

The preceding studies involved the development of new theory for analysis of complex optimization problems involving two-sided, nonlinear, nonconvex, discontinuous objective functions in both the sequential-move and simultaneous-move (game) contexts.

Scientific Programming. Much career work has involved the sophisticated use of the computer to solve difficult estimation and optimization problems. In the field of weapon systems analysis, developed a computer program which could automatically select the optimal solution from the multiple set of generalized Lagrangian solutions, in the case of a discontinuous, non-convex payoff function. Developed new optimization and estimation components for some of the largest defense-system simulation programs, including the US Navy's Systems Simulation Program and the Department of Defense QUICK war game model.

Statistical Software Development. Developed the first commercially available computer program package for implementation of the Box-Jenkins time series methodology. The Box-Jenkins (autoregressive-moving average) models are useful in system identification problems, such as time series analysis, forecasting, control, digital signal processing (DSP) and linear predictive coding of speech. The software analyzes spatial or temporal data in both the time and frequency domains (correlation and spectral analysis), and uses nonlinear statistical algorithms to estimate model parameters.

Sample Survey Design. Developed the sampling plans for a number of national and state sample surveys.

Communication Theory. In doctoral dissertation, developed the best known class of codes for correcting both additive and synchronization errors in noisy communications channels.

Experimental Design and Quality Control. Developed statistical experimental designs for test and evaluation, simulation model run-sets, chemical and physical experimentation, and industrial quality control applications.

Technical Training. Developed the popular short course, "Sample Survey Design and Analysis," which has been conducted on both a public (advertised) and private (in-house) basis. Has lectured government and contractor organizations on sample survey, time series analysis, statistical forecasting methods, and microsimulation. Served as professor of statistics at the University of Arizona.

Computer Languages, Packages, and Systems. Heavy experience in applications programming in FORTRAN, C, Visual Basic, database (dBASE/FoxPro/Access), SAS, and GIS on mainframe computers, minicomputers and microcomputers under

a variety of operating systems (MS-DOS/Windows/NT, UNIX, IBM, CDC, UNISYS, and others); experienced in application of statistical program packages, including SAS, SPSS and BMDP. Strong microcomputer experience, including the development of graphics-based microcomputer software for geographic information systems applications. Familiar with a variety of commercial microcomputer software (e.g., word processing, electronic spreadsheet, presentation, data base, groupware, desktop publishing, accounting).

Publications. Over fifty publications in the areas described above, and books on global population, energy and the environment, and tax reform.

Honors. Tau Beta Pi National Engineering Honorary Society
General Motors Scholarship (Carnegie-Mellon University, Pittsburgh)
NASA Fellowship (University of North Carolina at Chapel Hill)

Positions.

Consultant, 1974-present (various organizations, including Bank of Botswana (1999-2001), Academy for Educational Development (1994-95, 2002-03), First Union National Bank (1996-97), Chemonics (1991-92))
President and Manager, Vista Research Corporation, Tucson and Sierra Vista, AZ, 1988-91
Adjunct Professor of Statistics, University of Arizona, Tucson, AZ, 1982-86
Director of Research and Development and Principal Scientist of US Army Electronic Proving Ground's Electromagnetic Environmental Test Facility, Bell Technical Operations, Tucson and Sierra Vista, AZ, 1982-86, 1986-88
Principal Engineer, SINGER Systems and Software Engineering, Tucson, AZ, 1986

President and Manager, Vista Research Corporation,
Alexandria, VA, and Tucson, AZ, 1977-81
Vice President, JWK International Corporation, Annandale, VA,
1974-76
Principal, Planning Research Corporation, McLean, VA, 1972-
74
Member of the Technical Staff, Lambda Corporation / General
Research Corporation, McLean, VA, 1967-72
Senior Operations Research Analyst, Deering Milliken
Research Corporation, Spartanburg, SC, 1966-67
Operations Research Analyst, Research Triangle Institute,
Research Triangle Park, NC, 1964-66

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J. George Caldwell, PhD
**Consultant in Statistics, Mathematics and Information
Technology**

Summary: Consultant in information technology, operations research and statistics to business, finance, industry, and government. Specialist in forecasting / time series analysis / stochastic processes; financial modeling / risk management; optimization and optimal strategy determination; sample survey design and analysis; simulation, modeling, and analysis; systems and software engineering; data base design and implementation. Experienced in use of modern statistical analysis and database software (e.g., SAS/Oracle, SPSS, Microsoft Access, ArcView GIS, CHAID, Visual Basic, C, Fortran, SQL, Xbase) on UNIX and Microsoft Windows operating systems. Strong mathematical background (PhD in mathematical statistics), with experience in complex mathematical operations and algorithms such as linear operators, ARIMA models, matrix methods, statistical and optimization algorithms, numerical methods, Monte Carlo simulation. Recent banking risk management experience. Very strong programming skills (time series analysis, optimization, financial modeling / risk management). Diverse international experience. (Currently working overseas – looking to return to US.)

Experience

2002 – 2004, Management Consultant, US Agency for International Development / Academy for Educational Development, Lusaka, Zambia. Technical advisor to the Zambia Ministry of Education to develop an education management information system.

1999 – 2001, Director of Management Systems, Bank of Botswana, Gaborone, Botswana. Responsible for management

of all information technology operations for the Bank of Botswana, Botswana's central (reserve) bank. The Bank's computer system is comprised of over 300 networked microcomputers running under Windows NT/95/98/2000, Novell 4.1 and UNIX operating systems. Managed a group of 16 information technology specialists to operate and support the Bank's computer hardware and software applications (network management; Microsoft Office Suite; Internet/intranet; banking operations; accounting; investment portfolio / foreign reserve management; financial data services; economic analysis; human-resources management; and asset management. Introduced modern management and software engineering practices based on standards-based quality management (ISO 9000 Quality Management standard, ISO 12209 Information Technology standard, Carnegie Mellon University Software Engineering Institute Capability Maturity Model (CMM), DOD-STD-498 Software Development and Documentation). Responsible for system development (design, implementation), procurement, training, operations and maintenance (annual budget approximately USD3 million, exclusive of staff salaries, training, and noncomputer facilities and equipment). Responsible for setting Bank's IT vision, strategy, policy, procedures, security. Participated in all meetings of the Bank's Executive Committee and Board of Directors; reported to the Governor and Deputy Governor.

1998, Management Information System Consultant, Asian Development Bank / Academy for Educational Development, Dhaka, Bangladesh. Determined system requirements for the Bangladesh secondary education Educational Management Information System (EMIS) (review of current systems, identification of user information needs, identification and comparative evaluation of alternative systems, cost estimation, budget/implementation plan).

1997 – 1998, Consultant in Risk Management, Canada Trust Bank / Strategic Sourcing Inc., Toronto, Ontario, Canada. Responsible for the development of analytical models for risk management of the Bank's loan products. Utilized a “value-based management” approach to develop variable-rate pricing strategies that maximize shareholder value added, taking into account customer and product characteristics. Developed a model for risk-based variable-rate pricing of loans, using the techniques of Generalized Lagrange Multipliers (GLM) and mathematical simulation. The methodology determines pricing strategies that are optimal (i.e., maximize shareholder value added, or profit in excess of the cost of capital) with respect to the allocation of capital to the Bank's investment opportunities, taking customer, market, and policy factors into account. The computer simulation approach is used as an efficient framework for exploring alternative pricing strategies; the GLM method is used to determine pricing strategies that maximize shareholder value added (profitability) subject to constraints (on capital reserve requirements, probability of exceeding loss provisions, and other factors). Windows NT, UNIX, SAS, graphical user interface developed in Visual Basic 5.0.

1996 – 1997, Statistical / Operations Research Consultant, First Union National Bank / Strategic Sourcing, Inc., Charlotte, North Carolina. Conducted statistical analysis to develop customer segmentation models in support of bankcard marketing initiatives (credit scoring models). Developed lagrangian optimization model for identifying profitable locations for automatic teller machines (ATMs). Used SAS statistical analysis software and ArcView 3.0 geographic information system (spatial analyst) to develop logistic regression and discriminant analysis models to identify likely customers for PC banking. Models used a wide range of economic and demographic data at the block group and ZIP-code levels (population, income, employment, sales, shopping centers, crime statistics, traffic counts, ATM locations and characteristics). Windows 95 and UNIX (Sun Solaris SPARCcenter).

1995 – 1996, Statistical consulting in Malawi and Ghana, Africa. In Malawi, developed the sample survey design for the national annual school enrolment survey for the Ministry of Education. In Ghana, designed a national sample survey of the employment and income impact of nontraditional exports for the Ministry of Industry.

1993 – 1994, Software Engineering / Database Design, Government of Malawi / Academy for Educational Development, Lilongwe, Malawi. Designed and implemented the national civil service information system for the Government of Malawi Office of President and Cabinet, Department of Human Resource Management. System design was developed in full compliance with the DOD-STD-2167A (now MIL-STD-498) software development standard, and implemented on PC workstations (MS-DOS, dBASE, some UNIX, Informix). System was designed with a graphical user interface (GUI) that enabled personnel officers in the Department of Human Resources and Development to run a wide variety of queries and reports using "point-and-click" menus. Provided technical direction to a staff of six information technologists in modern software engineering discipline (structured, top-down, modular design, software development using a standard; data modeling, data base design, normalization).

1991 – 1993, US Agency for International Development / Chemonics, Program Monitoring and Evaluation, Cairo, Egypt. Served as Manager of Monitoring and Evaluation for the Local Development II - Provincial project in Egypt, the largest local-level infrastructure development project in the world. Designed and implemented a nationwide system for monitoring 16,000 local-level infrastructure development projects in Egypt (roads, potable water, waste water, environment, schools). Designed a national sample survey to collect data on a sampling basis from the projects. Implemented data collection and processing using dBASE, and conducted statistical analysis with SPSS/PC+.

1989 – 1991, President, Vista Research Corporation, Director of project to develop expert system for automatic military scenario generation, Tucson, Arizona. For the US Army Communications-Electronics Command, directed the project, "Research in Artificial Intelligence for Noncommunications Electronic Warfare Systems." Project involved the design and implementation of a prototype expert system for positioning electronic warfare equipment on a battlefield, taking into account the mission of friendly forces, the enemy threat, tactics, and terrain. Used the Army Corps of Engineers GRASS GIS for digital terrain data and the NASA CLIPS expert system for implementation of rules. Development in accordance with DOD-STD-2167A. Object-oriented design. System coded in C.

Prior to 1989, operated as an independent consultant or associate of various consulting firms and other organizations, including:

Founder and Manager of Vista Research Corporation, Tucson, Arizona and Alexandria, Virginia, contract research firm specializing in statistical / research design, simulation and modeling, policy analysis, and program evaluation in government and defense applications. Contracts with US Department of Health and Human Services, US Department of Education, US Air Force, US Army, US Office of Naval Research, US Agency for International Development, US Department of Agriculture, Government of the Philippines, African Development Bank, various state governments and private firms. Seven years.

Director of Research and Development and Principal Investigator of the US Army Electronic Proving Ground's Electromagnetic Environmental Test Facility, Fort Huachuca, Arizona. Four years.

Professor of Statistics at the University of Arizona, Tucson, Arizona. Four years. Taught graduate course in sample survey

design and analysis, and the required undergraduate statistics course for all students of business, management, MIS, and public administration.

Other qualifications: Working knowledge of French and Spanish. Director of over twenty technical projects. Developed the first commercially available Box-Jenkins computer program package for prediction, forecasting, and control of stochastic (time series) processes. Author of over fifty technical publications, including a book on tax reform.

Education:

PhD, Statistics, University of North Carolina, Chapel Hill, NC
BS, Mathematics, Carnegie Mellon University, Pittsburgh, PA

Contact Information: [deleted]

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Joseph George Caldwell, PhD

Contact Information: [deleted]

KEY QUALIFICATIONS: Management consultant. Consultant in information technology; systems and software engineering; management information systems; database design; statistics; economics; program planning, monitoring and evaluation; policy analysis; strategic planning and analysis. Consultant to US government agencies, state governments, corporations and foreign governments. Director/supervisor of projects in the areas of:

- o monitoring and evaluation, institutional development, planning and policy analysis of government programs in health, education, human services, urban problems, rural development, agriculture, environment, economics, public finance, tax policy analysis, cost-benefit analysis, personnel management information systems, engineering, decentralization, privatization, and democratization efforts

- o international development in Zambia, Botswana, Bangladesh, Ghana, Malawi, Egypt, the Philippines, and Haiti

- o information technology: computer models, management information systems design and implementation; database design; data modeling; Director of Management Systems (chief information officer) with the Bank of Botswana (Botswana's central bank); systems and software engineering; ISO-9000 Quality Management

Manager of contract research firm (seven years); successful bidder on numerous technical contracts, including four Small Business Innovation Research (SBIR) contracts. Director of more than twenty technical projects. Adjunct Professor of Statistics at the University of Arizona, Tucson, Arizona

EDUCATION: PhD, Statistics, 1966, University of North Carolina at Chapel Hill

BS, Mathematics, 1962, Carnegie-Mellon University, Pittsburgh, PA

PROFESSIONAL EXPERIENCE (in development applications):

Feb 2002 – present (March 2004). Technical Advisor in Educational Management Information Systems, Academy for Educational Development, Zambia. Currently working in Lusaka, Zambia, on a project funded by the US Agency for International Development, to develop an Educational Management Information System (EMIS) for the Zambia Ministry of Education. The purpose of the EMIS is to collect, store, and retrieve data (produce reports) from the Annual School Census, in support of program planning and analysis by the Ministry and donor agencies.

Jan 1999 – Jan 2001. Director of Management Systems, Bank of Botswana, Botswana. Responsible for all information technology operations for the Bank of Botswana, Botswana's central (reserve) bank (IT vision, strategy, policy, procedures, operations, acquisition, training, staff development)). The Bank's computer system is comprised of over 300 networked microcomputers running under Windows NT, Novell 4.1, UNIX, Windows 95/98/2000 operating systems. Software applications include Microsoft Office 97/2000 software and banking-related applications in support of banking operations, foreign reserve management, portfolio management, accounting, and human resources. Managed a department of 16 IT professionals, reporting to the Deputy Governor and Governor. Introduced modern IT management systems, including ISO 9000 Quality Management, ISO 12207 Information Technology Standard, the Software Engineering Institute Capability Maturity Model, and modern software and systems engineering tools (Popkin System Architect, CA ERWIN (Entity Relationship Modeling for Windows), CA BPWIN (Business Process Modeling for Windows)). Supervised approximately 30 IT projects.

Apr – Oct 1998. IT Specialist, Educational Management Information System Design for Secondary Education Sector Development Project, Asian Development Bank / Academy for

Educational Development, Bangladesh. Developed top-level requirements for the Educational Management Information System (EMIS) to be developed under a multi-year development program funded by the Asian Development Bank. Assignment included review of current systems, identification of user information needs, and identification and comparative evaluation of alternative systems.

Sep 1997 – Mar 1998. Consultant in Risk Management, Strategic Sourcing Inc., / Canada Trust Bank, Bank Risk Management, Canada. Consultant in risk management to Canada Trust Bank. Responsible for the development of analytical models for risk management of the Bank's loan products. Developed a model for risk-based variable-rate pricing of loans, using the techniques of Generalized Lagrange Multipliers (GLM) and mathematical simulation. The methodology determines pricing strategies that are optimal with respect to the allocation of capital to the Bank's investment opportunities, taking customer, market, and policy factors into account. The computer simulation approach is used as an efficient framework for exploring alternative pricing strategies; the GLM method is used to determine pricing strategies that maximize stockholder value added (profitability) subject to constraints (on capital reserve requirements, probability of exceeding loss provisions, and other factors). Windows NT, UNIX, SAS, VB5.

May 1996 – Jul 1997. Statistical Consultant to Strategic Sourcing Inc. / First Union National Bank, Statistical and Optimization Computer Models in Banking, USA. Consultant to First Union National Bank (US sixth largest bank), conducting statistical analysis to develop customer segmentation models in support of bankcard marketing initiatives. Developed optimization model for identifying profitable locations for automatic teller machines (ATMs). Used SAS statistical analysis software and ArcView 3.0 geographic information system (spatial analyst) to develop logistic

regression and discriminant analysis models to identify likely customers for PC banking. Models used a wide range of economic and demographic data at the block group and ZIP-code levels (population, income, employment, sales, shopping centers, crime statistics, traffic counts, ATM locations and characteristics). Windows 95 and UNIX (Sun Solaris SPARCcenter).

Nov 1995 – May 1966. Survey Statistician, Income and Employment Survey for Ghana Trade and Investment Program, Sigma One Corporation / USAID, Ghana. As part of the US Agency for International Development's Trade and Investment Program in Ghana, Dr. Caldwell designed and analyzed the survey to estimate the employment and income associated with every \$1,000 of exports in non-traditional areas. The survey was designed to produce national estimates and estimates for selected product sectors (pineapples, pineapple juice, tuna loins / canned tuna, and cashew nuts). The sampling plan involved a probability sample of 300 exporting firms selected with probabilities proportional to a measure of size (export value) without replacement.

May – Jun 1995. Sample Survey Design and Sampling Statistician, Academy for Educational Development / USAID, Malawi. For the Malawi Ministry of Education, Dr. Caldwell developed the sample design for the Annual Primary School Survey. Previously, the annual school survey was a census of all 3,400 schools and three million students; the amount of time and effort required to collect and process all of these data was placing a serious burden on the Planning Unit resources. The sampling plan involves a probability sample of 500 schools selected with probabilities proportional to a measure of size (the previous year's enrollment) using the Rao-Hartley-Cochran method. With the probability sampling approach, all of the information required by the Planning Unit will be available for a fraction of the effort required by the previous approach.

Jun 1993 – Dec 1994. Personnel Management Information System Developer, Civil Servant Personnel Management Information System, Academy for Educational Development / USAID, Malawi. For the Malawi Department of Human Resources Management and Development, Dr. Caldwell designed and implemented the Malawi Civil Service Personnel Management Information System. The system was developed using the dBASE database management information system, for use on microcomputers (standalone or networked) using the MS-DOS operating system. The system includes a variety of demographic and employment-related data for Malawian civil servants, and offers the users (personnel officers) a wide range of easy-to-use data entry and query/report capabilities. Experienced database users may generate queries and reports using SQL (Structured Query Language) commands or any of dBASE's automated query and report-generation features, but the system is designed with a powerful graphical user interface (GUI) so that a nontechnical user may generate all standard queries and reports without the need for any programming or entering of complicated commands, simply by making selections from a suite of menus. Data entry is facilitated by a series of easy-to-use data entry screens, with ample on-line help and validation of all entered data. Employee records may be displayed on the screen or printed.

The system development effort was conducted in full compliance with the DOD-STD-2167A software development standard, and included the production of almost 1,000 pages of detailed system documentation, including a System Design Document, Software Requirements Specification, Software Design Document, Software Programmer's Manual, Software Product Specification, and Software User's Manual. The project included on-the-job training of members of the Department's Management Information Systems Unit (systems analysts, programmers) in systems engineering (requirements analysis, technology assessment,

synthesis of alternatives, specification of evaluation criteria, selection of a preferred alternative, top-level design, detailed design (optimization), implementation, and test), the modern software engineering discipline (structured, top-down design), management information system design, dBASE, software development project management, and basic microcomputer upgrading and repair; and classroom instruction for system users (personnel officers) in use of the system for data entry and retrieval (queries and report generation).

Mar 1991 – Oct 1992. Manager of Monitoring and Evaluation, Chemonics International / USAID, Egypt. Served as manager of Monitoring and Evaluation for the USAID-funded Local Development II - Provincial (LDII-P) project, which provided technical assistance in the development and maintenance of USAID-funded infrastructure projects in Egypt (potable water, waste water, roads, buildings, rolling stock, environment, and information systems). The LDII-P project was the largest USAID local development project in the world, having funded the development of over 13,000 local-level projects. In addition to infrastructure development, a major goal of the project was to promote government decentralization and increase the capacity of local governments to plan, finance, implement, and maintain local projects. Principal activities included: (1) the design and implementation of a nationwide project monitoring survey to assess the implementation, operating, and service status of projects; (2) the development of an indicators system to assist local officials in the assessment of need for public services, the availability of services, and the identification and prioritization of local development projects; (3) the design and implementation of a governorate project monitoring system to assist governorate detection and follow-up of implementation and operational problems. On this project, Dr. Caldwell made heavy use of automated management information system tools (dBASE, SPSS) to store, process, and retrieve data on project status and needs

assessment (including continuous monitoring of project status indicators), and applied the techniques of sample survey (questionnaire development, stratified random sampling) and rapid appraisal techniques (focus group interviews) to assist end-of-project evaluation, as well as continuous monitoring of indicators. Dr. Caldwell lectured on the use of geographic information systems (GISs) in development planning, and supervised training of development planners in use of the PC-ARC/INFO GIS.

Oct 1979 – Jan 1982. Project Director / Chief of Party, Economic and Social Impact Analysis / Women in Development (ESIA/WID) Project, Vista Research Corporation / USAID / NEDA, Philippines.

The purpose of this project, sponsored jointly by the Philippines National Economic and Development Authority (NEDA) and the US Agency for International Development, was to help improve the capability of the Government of the Philippines to monitor and measure economic progress, social change, and the impact of development projects, including the effects on women in their dual role as agents and beneficiaries of development. The contract provided technical services to assist the Philippines Institute of Development Studies (PIDS) to develop and validate analytical frameworks and indicators for analyzing and measuring progress and the impact of development projects on selected areas of concern; to design and field test efficient means for measuring and monitoring project progress and impact indicators; and to determine a better understanding of the mechanisms by which development projects achieve their goals. The development projects included a wide variety of substantive fields -- health, nutrition, and family planning; education; integrated agricultural production and marketing, aquaculture production, and agro-reforestation; integrated area development; feeder roads; ports; local water systems; electrification; small-scale industries, and tourism. The ESIA/WID project identified and evaluated the use of a variety of statistical design and analysis techniques to assist project impact assessment: quasi-experimental designs,

sample survey, analysis of variance, multiple regression analysis, questionnaire design, indicator development. For the Philippines Ministry of Health, Dr. Caldwell developed alternative management information system (MIS) designs to support both agency operations and program monitoring. Dr. Caldwell served as chief of party and directed a team of eleven Ph.D. consultants on the ESIA/WID project.

Oct 1975 – Sep 1976. Project Director /Supervisor, Economic Policy Analysis for the Government of Haiti, JWK Intl Corp / USAID, Haiti. Under a contract funded by the US Agency for International Development, this study determined agricultural and tax policy changes that the government of Haiti could employ to increase foreign exchange and increase the income of the small farmer. The study addressed five commodities -- coffee, cotton, sisal, mangoes, and meat (major emphasis on coffee). The project included the use of sample surveys to collect up-to-date data on commodity prices. A major goal of the project was the transfer of policy analysis capabilities to members of the Haitian Ministry of Agriculture. Dr. Caldwell supervised a team of four Ph.D. consultants (economists) on this project.

Summary of Experience Related to Development

Management Information Systems / Systems and Software Engineering / Computer Models, Systems and Applications. Dr. Caldwell has directed numerous software engineering projects, applying the principles of systems and software engineering. This approach includes requirements specification and analysis, technology review, synthesis of system alternatives, cost-effectiveness analysis of alternatives and selection of a preferred alternative, detailed design, implementation and test. For the software subsystem he utilizes top-down, structured design, and has experience using international standard, including the ISO 9000 Information Technology Standard, the US Department of

Defense's Software Development Standard (DOD-STD-2167A and MIL-STD-498). He has extensive hands-on microcomputer systems development experience. He designed and implemented a 50,000-line C-language microcomputer program (an integrated geographic information system / expert system), and personally conducted all of the software and database design and most of the programming for the information systems work in Egypt and Malawi (dBASE and SPSS command languages, Quattro Pro presentation graphics, C programming language). In a recent banking application, he developed a geographic information system application (ArcView 3.0 GIS, SAS) to identify good locations for bank automated teller machines (ATMs). He recently developed simulation/optimization system for a bank to determine optimal loan pricing strategies (Windows NT, Microsoft Visual Basic 5.0). Dr. Caldwell's computer experience includes mainframe, mini- and microcomputer applications. Most recent work has been on 30x86 microcomputers (using MS-DOS, Windows, and UNIX operating systems). His system design work includes both hardware and software system design. Much experience with MS-Windows application development systems (Visual Basic, C/Visual C++, Visual Fortran, Visual FoxPro).

Computer Models for Forecasting and Demographic Analysis. Dr. Caldwell developed the first commercially-available general-purpose Box-Jenkins computer-forecasting package, and microcomputer software for making demographic projections (cohort-component, synthetic estimation). For the US Department of Health and Human Services, he directed the project to develop a prototype microsimulation forecasting model and a statistical reporting system to provide the data required by the model. The model -- called MICROSIM -- was developed to forecast caseloads and expenditures for HHS programs under various policy assumptions.

Artificial Intelligence / Expert Systems / Geographic Information Systems. For the US Army Communications-Electronics Command, directed a project to develop an expert system to position military units and equipment, taking into account the location of friendly and opposing forces, mission, tactical combat rules, and digital terrain data. The system incorporated the NASA-developed C-Language Integrated Production System ("CLIPS") expert system and used digital mapping data extracted from the US Army's Geographic Resources and Services System (GRASS) geographic information system (GIS). The system was developed for MS-DOS-based 80x86 microcomputers, and included a comprehensive graphical user interface (mouse, windows, and menus).

Privatization, Decentralization, and Democratization. Broad experience in monitoring, evaluation, and policy analysis related to privatization, decentralization, and democratization, with special emphasis on the development of "harmonious" tax systems that support these objectives; director of several national-level cost-benefit analysis projects. In the Haiti agricultural policy analysis project mentioned above, emphasis was on the identification of changes in tax policy that would increase small-farmer incomes. In the Egypt LDII-P project, a major thrust of the project was to implement the infrastructure development projects at the village level, using local contractors. Training was provided in project planning, design, selection, contracting procedures, monitoring, and financing; Dr. Caldwell directed the development of systems to facilitate decentralized (local-level) development, and to monitor progress in local capacity to design, implement, and finance local-level projects. In the Philippines ESIA/WID project, heavy emphasis was placed on assessment of the role of women in development and on estimation of income changes associated with development projects. In his book on tax policy, Dr. Caldwell presents a systematic methodology for tax system development

("tax engineering") which takes into account social, economic, and political constraints and objectives.

Management Consulting / Business Experience. Dr. Caldwell has substantial experience in management consulting to industry, including consulting, training, and system development in forecasting, quality control, product improvement, process control, and economic analysis of production alternatives. He founded and managed his own contract research firm (Vista Research Corporation, operated full-time for seven years), and set up a ladies' fashions importing/retailing firm (Sonora Marketing Corporation). In these efforts, Dr. Caldwell designed, implemented and managed all major functional components of the operations (marketing, production, and finance).

Statistics / Sample Survey Design / Program Monitoring Systems.

Dr. Caldwell developed the design for many important national sample surveys and statistical reporting systems. He specializes in the development of analytical survey designs to collect data for model development, and has developed new techniques for handling nonresponse in longitudinal surveys. Surveys and reporting systems include:

- o Zambia Education Management Information System
- o Ghana Trade and Investment Program Survey
- o Malawi Annual Primary School Enrollment Survey
- o National Center for Health Services Research Hospital Cost Data Study
- o Professional Standards Review Organization Data Base Development Study
- o Study of Impact of National Health Insurance on Bureau of Community Health Service Users
- o 1976 Survey of Institutionalized Persons
- o Sampling Manual for Utilization Review of Medicaid
- o Sampling Manual for Social Services (Title XX) Reporting Requirements

- o Sampling Manual for Office of Child Support Enforcement Reporting Requirements
- o Dept. of Housing and Urban Development Housing Market Practices Survey
- o Research Design for the Urban Arterials Section of the Highway Capacity Manual
- o Elementary and Secondary School Civil Rights Survey

Evaluation Research. Dr. Caldwell has conducted a number of evaluation research studies, including the following:

- o Evaluation Survey of USAID Local Development Projects in Egypt
- o Social Services Effectiveness Evaluation for West Virginia
- o Day Care Cost-Benefit Study
- o Vocational Rehabilitation Evaluation Standards Study
- o Cost-Benefit Analysis of National Institute for Alcohol Abuse and Alcoholism Alcoholism Treatment Centers
- o Medicaid Standards Impact Assessment

Public Finance. In addition to his work in tax policy analysis and cost-benefit analysis, Dr. Caldwell directed studies to develop alternative allocation / matching formulas for major state/federal programs:

- o Vocational Rehabilitation State Allocation Formula
- o Medicaid and AFDC Matching Percentage Formula

Operations Research and Statistics in Industrial and Commercial Applications. Dr. Caldwell has applied a wide variety of operations research and statistical techniques to solve practical problems in industrial and commercial applications. Applications include the use of simulation and modeling, experimental design, and statistical forecasting techniques to solve problems in process control, statistical quality control, demand forecasting, and economic analysis of alternative modes of production in the textile and pharmaceutical industries, and test and evaluation of

electronic systems and equipment (communications and noncommunications).

Technical Training. In addition to his role as university professor, Dr. Caldwell developed the popular seminar, "Sample Survey Design and Analysis."

Computer Languages, Packages, and Systems. Heavy experience in applications programming in FORTRAN, C/C++, Visual Basic and dBASE/FoxPro on mainframe computers, minicomputers and microcomputers under a variety of operating systems (MS-DOS, Microsoft Windows, UNIX, IBM, CDC, UNIVAC, and others); experienced in application of statistical program packages, such as SAS, BMDP, and SPSS. Strong microcomputer experience, including the development of graphics-based microcomputer software for geographic information systems applications. Familiar with a variety of commercial microcomputer software (e.g., word processing, electronic spreadsheet, data base, desktop publishing, accounting). Experience working in a Microsoft Windows / UNIX network environment (VB, SAS, Oracle), using Hummingbird, NT and Lotus Notes networking software. Familiar with Microsoft Office suite of products (Word, Access, Excel, PowerPoint) on Windows 95/NT/XP/2002 or UNIX client/server system.

LANGUAGES: English (native); working knowledge of French and Spanish; limited German and Arabic (for transportation, household use)

GEOGRAPHIC EXPERIENCE: USA, Canada, Haiti, Philippines, Egypt, Malawi, Ghana, Bangladesh, Botswana, Zambia

PROFESSIONAL AFFILIATIONS: Institute for Management Sciences and Operations Research (INFORMS), American Statistical Association, Institute of Mathematical Statistics

HONORS / AWARDS: Tau Beta Pi National Engineering Honorary Society, General Motors Scholarship (Carnegie-Mellon University, Pittsburgh), NASA Fellowship (University of North Carolina at Chapel Hill)

PUBLICATIONS: Over fifty publications in the areas described above, and books on tax reform and global population (list available on request). Many articles on diverse topics (politics, music, guitar, defense, religion / spirituality / philosophy, science fiction).

POSITIONS:

Consultant, 1974-present (various organizations, recently including the Academy for Educational Development, Chemonics International, First Union National Bank, Canada Trust, Western Research Company)

Director, Management Systems Department, Bank of Botswana, 1999-2001

President and Manager, Vista Research Corporation, Tucson and Sierra Vista, AZ, 1988-91

Professor of Statistics, University of Arizona, Tucson, AZ, 1982-86

Director of Research and Development and Principal Scientist of US Army Electronic Proving Ground's Electromagnetic Environmental Test Facility, Bell Technical Operations, Tucson and Sierra Vista, AZ, 1982-86, 1986-88

Principal Engineer, SINGER Systems and Software Engineering, Tucson, AZ, 1986

President and Manager, Vista Research Corporation, Alexandria, VA, and Tucson, AZ, 1977-81

Vice President, JWK International Corporation, Annandale, VA, 1974-76

Principal, Planning Research Corporation, McLean, VA, 1972-74

Member of the Technical Staff, Lambda Corporation / General
Research Corporation, McLean, VA, 1967-72
Senior Operations Research Analyst, Deering Milliken
Research Corporation, Spartanburg, SC, 1966-67
Operations Research Analyst, Research Triangle Institute,
Research Triangle Park, NC, 1964-66

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4. Caldwell, J.G., Economic Simulation and Analysis Report, Sales and Price Simulator, and New Product Generator, (reports on proprietary work done for client), Lambda Corporation, 1969
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8. Caldwell, J.G., Conflict, Negotiation, and General-Sum Game Theory, Lambda Paper 45, Lambda Corporation, 1970

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11. Caldwell, J.G., Box-Jenkins Filter Feasibility Study, Lambda Corporation, 1971
12. Caldwell, J.G., AMTRAK Passenger Car Inspection Plan, American Management Systems, Arlington, Virginia, 1971
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14. Caldwell, J.G. and G.E. Pugh, Multiple Resource-Constrained Game Solution, Lambda Corporation, 1972. Also: Caldwell, J.G., Multiple Resource-Constrained Game Solution: Computer Program Description and User's Manual, Lambda Corporation, 1972
15. Caldwell, J.G. et al., Correlation/Tracking Performance Study -- DCP Input (U), Vols I and II, Report R-1650, Planning Research Corporation / Navy Space Systems Activity (NAVELEX), 1973 (Secret)
16. Caldwell, J.G. et al., Improvements to the Systems Simulation Program, Vols. I and II, Report R-1801, Planning Research Corporation / Navy Space Systems Activity (NAVELEX), 1974 (Secret)

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21. Caldwell, J.G., Sample Design for National Health Insurance Survey of BCHS Users, J.G. Caldwell and Associates / Health Services Administration, 1975
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