

Proposal

PROPOSAL INFORMATION REQUEST

To be completed by Division

Proposal will be processed as indicated:

I PROPOSAL NUMBER: 32850-MA NEW: _____ YEARS: _____

REVISED BUDGET: _____ FORMERLY: _____ SEE ALSO: _____

II TITLE: Visualization Methods for the Exploration of High Dimensional DataCHIEF INVESTIGATOR(S): Prof. Edward J. WegmanSCIENTIFIC BREAKDOWN: Publ & Statistic (Andersen), MA

DATE ACKNOWLEDGED: _____

NO. COPIES RECD: 20 NO. COPIES REQUIRED BY DIVISION: 6

EVALUATORS:

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Dr. Douglas Tang (WRAIR)

Dr. Eugene Dutoit (Ft
Benning)

Dr. David Scott (Rice - on sabbatical at NSA - call Rice for address)

ACTION: () ACCEPT; () DECLINE; () WITHDRAW

III ENVIRONMENTAL IMPACT STATEMENT

YES

NO

IV STATEMENT OF DISCLOSURE PREFERENCE RECEIVED

YES

NO

REMARKS:

George Mason University

Fairfax, Virginia 22030-4444

(703) 993-1000

TDD: (703) 993-1002

November 12, 1993

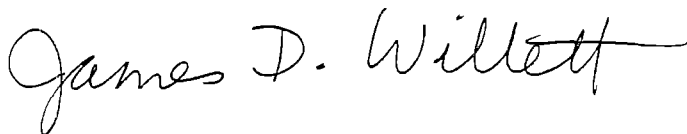
Director
US Army Research Office
ATTN: AMXRO-RT-IP-P
4300 S. Miami Boulevard, Research Plaza
P.O. Box 12211
Research Triangle Park, NC 27709-2211

Dear Sir/Madam:

Enclosed please find a renewal proposal submitted for Dr. Edward J. Wegman, Director, Center for Computational Statistics, George Mason University. Dr. Wegman's proposal is entitled "**Visualization Methods for the Exploration of High Dimensional Data**" and is being submitted to the Mathematics section of the Office of Army Research.

If you have any questions regarding the technical content of this proposal, please feel free to contact Dr. Wegman at 703/993-1700; questions regarding budget, university policies and procedures, or contract negotiations should be directed to Ms. Jennifer Murphy, Director, Office of Grants Administration, at 703/993-2988. A copy of George Mason University's cost rate agreement is attached.

Sincerely,



James D. Willett
Vice Provost for Research and Graduate Studies

Enclosure

cc: E. Wegman

397007

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN #:

DATE: July 27, 1993

INSTITUTION:

George Mason University
4400 University Drive

FILING REF.: The preceding
Agreement was dated
May 24, 1990

COPY

Fairfax

VA 22030-

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section II.

SECTION I: INDIRECT COST RATES*

RATE TYPES: FIXED		FINAL	PROV. (PROVISIONAL)	PRED. (PREDETERMINED)	
TYPE	EFFECTIVE PERIOD		RATE (%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
PRED.	07/01/93	06/30/96	47.0	On-Campus	All Programs
PRED.	07/01/93	06/30/96	26.0	Off-Cmpus	All Programs
PROV.	07/01/96	UNTIL AMENDED			Use Above Rates

*BASE:

Direct salaries and wages excluding all fringe benefits.

TREATMENT OF FRINGE BENEFITS:

Fringe benefits are specifically identified to each employee and are charged individually as direct costs. The directly claimed fringe benefits are listed in the Special Remarks Section of this Agreement.

TREATMENT OF PAID ABSENCES:

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made.

INSTITUTION:
George Mason University

AGREEMENT DATE: July 27, 1993

SECTION II: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the institution were included in its indirect cost pool as finally accepted: such costs are legal obligations of the institution and are allowable under the governing cost principles; (2) The same costs that have been treated as indirect costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the institution which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the institution to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from indirect to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the cost for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-88, and should be applied to grants, contracts and other agreements covered by the Office of Management and Budget Circular A-21, subject to any limitations in A above. The institution may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing indirect costs by a means other than the approved rate(s) in this Agreement, the institution should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of indirect costs allocable to these programs.

INSTITUTION:
George Mason University

AGREEMENT DATE: July 27, 1993

F. SPECIAL REMARKS:

OFF-CAMPUS DEFINITION: For all activities performed in facilities not owned by the institution and to which rent is directly allocated to the project(s), the off-campus rate will apply. Actual costs will be apportioned between on-campus and off-campus components. Each portion will bear the appropriate rate.

Fringe Benefits include: FICA, Retirement, Health Insurance, Life Insurance and TIAA.

The following Fringe Benefits are included in the indirect costs and are NOT charged as DIRECT costs: Workers' Compensation and Unemployment Compensation.

BY THE INSTITUTION:
George Mason University

(INSTITUTION)

(SIGNATURE)

(NAME)

(TITLE)

(DATE)

BY THE COGNIZANT AGENCY
ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES
(AGENCY)

(SIGNATURE)

for Frank T. McKune
(NAME)

DIRECTOR, DIVISION OF COST ALLOCATION AND LIAISON
(TITLE)

July 27, 1993
(DATE)

HHS REPRESENTATIVE: Harvey Cummins

Telephone: (202) 401-2808

COVER PAGE FOR PROPOSAL TO THE ARMY RESEARCH OFFICE

SUBMIT 20 COPIES OF PROPOSAL TO: Director US Army Research Office ATTN: AMXRO-RT-IP-P P.O. Box 12211 Research Triangle Park, NC 27709-2211		For Consideration by ARO Organization Unit(s) <small>(Indicate the most specific unit known, i.e. program, division, etc.)</small> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> Mathematics <input type="checkbox"/> Electronics <input type="checkbox"/> Physics <input type="checkbox"/> Engineering <input type="checkbox"/> Chemistry </div> <div style="width: 45%;"> <input type="checkbox"/> Environmental <input type="checkbox"/> Computer Science <input type="checkbox"/> Biology <input type="checkbox"/> Materials </div> </div>		For ARO Use Only ARO Proposal Number <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Date Received</td> <td style="width: 33%;">Number of Copies</td> <td style="width: 33%;">Division Assigned</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>		Date Received	Number of Copies	Division Assigned			
Date Received	Number of Copies	Division Assigned									
Employer Identification Number (EIN) or Taxpayer Identification Number (TIN) 54-0836354A1		Contractor Establishment Code (CEC) <small>(if known)</small> Is This Proposal Being Submitted to Another Federal Agency? YES ___ NO <u>X</u> If YES, List the Agency or Agencies.									
Name of Organization to Which Award Should be Made: <u>George Mason University</u>		Administrative Address of Organization, Including Zip Code: <u>Office of Grants Administration</u> <u>George Mason University, Room 144 West Bldg.</u> <u>Fairfax, VA 22030</u>									
Institutional Code (If known)		Is Submitting Organization: <input type="checkbox"/> For-Profit <input type="checkbox"/> Small Business <input type="checkbox"/> Disadvantaged Business <input type="checkbox"/> Woman-Owned Business <input checked="" type="checkbox"/> Educational Institution: <input type="checkbox"/> Historically Black College or University <input type="checkbox"/> Minority Institution <input type="checkbox"/> Other Non-Profit									
Branch/Campus/Other Component (Where work is performed, if different)		Institutional Code (If known)									
Title of Proposed Project <u>Visualization Methods for the</u> <u>Exploration of High Dimensional Data</u>		Type of Award Requested: <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> Single Investigator <input type="checkbox"/> Young Investigator Program <input type="checkbox"/> STIR </div> <div style="width: 45%;"> <input type="checkbox"/> Research Instrumentation <input type="checkbox"/> HBCU/MI <input type="checkbox"/> Other (Specify) </div> </div>									
Requested Amount \$ <u>278,998</u>	Proposed Duration (1-60 months) <u>36</u> months	Requested Starting Date <u>1/1/94</u>	Proposal Valid Until: <small>(minimum of 6 months)</small> <u>5/31/94</u>								
Check Appropriate Box(es) If This Proposal Includes Any of the Items Listed Below: <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%;"> <input type="checkbox"/> Vertebrate Animals <input type="checkbox"/> Human Subjects <input type="checkbox"/> Group Proposals <input type="checkbox"/> Historical Places <input type="checkbox"/> Limited Rights Data </div> <div style="width: 33%;"> <input type="checkbox"/> National Environmental Policy Act <input type="checkbox"/> Proprietary and Privileged Information <input type="checkbox"/> Research Involving Genetically Engineered Organisms <input type="checkbox"/> Facilitation for Scientists/Engineers with Disabilities </div> <div style="width: 33%;"> <input type="checkbox"/> Initial Research Funds (From all Federal Sources) <input type="checkbox"/> Disclosure of Lobbying Activities </div> </div>											
PI/PD Department Center for Computational Statistics		PI/PD Postal Address Dr. Edward J. Wegman Center for Computational Statistics, Room 157 ST2 George Mason University Fairfax, VA 22030									
PI/PD Fax Number 703/993-1700											
Typed Names and Signatures		Telephone Number	Facsimile Number								
PI/PD <u>Edward J. Wegman</u>		<u>703/993-1691</u>	<u>703/993-1700</u>								
Co-PI/PD											
Administrative Representative Authorized to Conduct Negotiations:											
Primary: <u>Jennifer O. Murphy, Director,</u>											
Alternate: <u>Grants Administration</u>											
Authorized Representative Title: <u>Director, Grants Administration</u>		Date Signed: <u>7-1-94</u>									
Typed Name: <u>Jennifer O. Murphy</u>		Signature: <u>[Signature]</u>									

**PROTECTION OF PROPRIETARY INFORMATION
DURING EVALUATION AND AFTER AWARD**

It is the policy of the US Army Research Office to treat all research proposals as privileged information prior to award and to disclose the contents only for purposes of evaluation. Technical evaluation of these proposals normally are made by highly qualified scientists from the Government and leading scientists and other preeminent experts outside the Government to ascertain the merits of the proposal. While you may, if you wish, restrict the evaluation of your proposal to only scientists within the Government, to do so may prevent it from receiving an evaluation by those most qualified in the field of your proposal. Therefore, we ask permission to send your proposal outside of the Government if that is necessary to obtain an unrestricted evaluation by such qualified individuals.

All reviewers are made aware that proposals sent to them shall not be duplicated, used, or disclosed in whole or in part for any purpose other than to evaluate the proposal, without the written permission of the offeror.

You should be aware that despite all precautions, we can protect the confidentiality of proprietary information contained in proposals only to the extent that it is exempt from disclosure under the Freedom of Information Act (FOIA; 5 U.S.C. 552). Generally, Exemption 4 of the FOIA (5 U.S.C. 552(b)(4)) will protect from release information submitted to the Government that constitutes either (1) a trade secret or (2) commercial or financial information which is privileged or confidential. Any such proprietary information contained in your proposal should be marked in accordance with FAR 15.509.

Please complete the following statement indicating your preference for treatment of your proposal during the evaluation phase and, should a grant or contract be awarded, after award.

STATEMENT OF DISCLOSURE PREFERENCE

George Mason University in submitting proposal Visualization Methods for the
(Organization) (Title)
Exploration of High Dimensional Data with Dr. Edward J. Wegman
(Name)

as Principal Investigator require the following procedure be used during its evaluation:

(X) Permission is hereby granted to the US Army Research Office to evaluate this proposal in accordance with its normal procedures which may include evaluation by evaluators both within and outside the Government with the understanding that written agreement not to disclose the information contained therein shall not be obtained from any nongovernment evaluators. Permission to release outside the Government, for evaluation purposes only, those pages of the proposal marked in accordance with FAR 15.509 is hereby granted, except for the following pages or sections: _____

() Restrict the evaluation of the above proposal to Government personnel only.

To reduce administrative requirements, you may complete the following information by checking the appropriate blocks:

If this proposal results in a contract or grant, the offeror grants ARO the authority to release the following portion of its proposal in response to requests under the Freedom of Information Act, only after such award, without prior contact with the offeror:

Cover Page	(X) Yes	() No	Statement of Work	(X) Yes	() No
Abstract	(X) Yes	() No	Vitae	(X) Yes	() No
Technical Proposal	(X) Yes	() No	Cost Proposal/Budget	(X) Yes	() No

Date

Jennifer O. Murphy
Signature of person authorized to sign for organization
Jennifer O. Murphy, Director, Grants Administration

Date

E.J. Wegman
Signature of Principal Investigator
Edward J. Wegman

Table of Contents

Executive Summary	3
1. Introduction	4
2. Virtual Reality, Immersive Technology and Scientific Visualization	5
3. Visualization using the Grand Tour	7
4. Pattern Recognition using Recursive Functional Inference	10
5. Project Task Areas	15
6. Virtual Reality and Computing Facilities	17
7. Results of Previously Funded Work by ARO	19
Budget	20
References	21
Resume	
Current and Pending Support	
Cost Proposal	

A Renewal Proposal to the
Army Research Office
Attention: Dr. Gerald Andersen
for the support of research entitled

**Visualization Methods for the
Exploration of High Dimensional Data**

Proposed Start Date: 1 January 1994

submitted by

Edward J. Wegman

George Mason University
Center for Computational Statistics
157 Science-Technology Building #2
Fairfax, VA 22030

Executive Summary

This proposal brings together elements of virtual reality technology (immersive technology) and elements of scientific visualization to address issues of high dimensional spatial and volumetric visualization problems. Applications of such methods would be to the visualization of any spatially or volumetrically distributed data with multivariate data characterization at each pixel or voxel. A military application might be, for example, characterization of mine fields, a semi-military application might be the volumetric visualization of toxic waste sites on military reservations, while a civilian application might be the visualization of tumor structures in breast cancer. This proposed research has a very strong dual usage character.

We propose to develop several visualization methodologies based on the concept of a mathematical grand tour and based on recursive, data-adaptive pattern recognition. These visualization methods will be embedded in immersive display systems which include a head-mounted display system and a stereographic projection system. Research will include tasks oriented toward developing approximation models for general two- and three-dimensional geometric structures, visualizing spatial and multivariate data, integrating high performance parallel and graphics computers, and developing psychometric comparisons for stereo visualization.

Computer and virtual reality resources are largely in place so that there will be little or no latency in the development of this project. An added bonus is the leverage obtained with the impending installation of an Intel Paragon supercomputer at George Mason University.

1. Introduction

This proposal focuses on the alliance of elements of virtual reality technology and elements of scientific visualization to address issues of mine detection and related spatial and volumetric visualization problems. By virtual reality or virtual environments, we mean an immersive visual and audio technology such that experimenter has little or no awareness of the real environment. For our purposes of data visualization, this is intended as a focusing device so that the experimenter has a heightened sense of awareness of the problem at hand and, thus, can concentrate in a natural way his or her full mental resources. We believe that this singular focus is particularly valuable in adversarial settings in which human lives are at stake. Moreover, we believe that the immersive technology, because of its three dimensional aspects, will be less fatiguing than other types of human-computer interfaces, current technology limitations notwithstanding.

Much of currently fashionable work on scientific visualization has been focused on rendering of flow fields arising from combustion or meteorological applications, molecular, atomic or subatomic particle dynamics, and other settings modeled with partial differential equation models. Our focus has been, in contrast, on data representation, exploratory data analysis and model building using high performance computer graphics. It is our intention to continue the development of our graphics and visualization tools in the context of immersive technology. In the remainder of this proposal, we shall describe our general research objectives and our specific tasks with detailed description of our technical approaches.

Section 2 is intended to explore several alternative views of virtual environments and immersive technology. Section 3 describes several approaches to visualization using the grand tour concept as well as some of the technical details of implementing the grand tour. Section 4 describes the use of pattern recognition techniques and, in particular, data-driven, adaptive methods. We highlight in this section recursive, functional analytic approaches to constructing discriminant functions. Section 5 contains a concise summary of the tasks we are proposing. Section 6 describes our virtual reality and computing facilities. Section 6 also describes the human resources available for maintaining the VR Laboratory and computing facilities. Section 7 describes the results of previous ARO funding.

2. Virtual Reality, Immersive Technology and Scientific Visualization

The development of virtual reality as a graphics construct began in the mid-seventies with attempts to develop more realistic flight simulation. The standard paradigm was to have training pilots look at a visual display screen. The effect, as might be expected, was that these pilots were aware that they were looking at a visual display screen and, consequently, had a comparatively strong sense of unreality about the whole exercise. An approach to overcoming this problem has become known as *virtual reality*. The intent of the virtual reality construct is to create a more intimate sense of involvement (originally in the flight simulation), i.e. a sense of immersion. Virtual reality constructs can be implemented in several ways. The goal is to recreate via computer the items that the subject's senses might sense in reality. Visually, this would mean replacing a flat display screen with binocular stereo views which would change along with the motion of the subject's head. That is, if the subject looked down, he or she would see the view which is below. If the subject looked backwards, he or she would see the the view in back. This is accomplished with a headgear containing miniature binocular video displays. There is an audio component which can be achieved in the same headgear by incorporating binaural headphones. Finally, one would want to create a tactile component which can be achieved by incorporating instrumented gloves. The technology is now becoming commercially available, but has been demonstrated for several applications including the flight simulation application as well as for an interesting application giving a sense of liberation to handicapped individuals.

The major new thrust in statistical data analysis and visualization is to combine scientific visualization, exploratory data analysis and virtual reality into a new technology for exploring data. There is a history of several years of experimentation with 3-D visualization and many aspects of this tool are in hand. Data analysis has seen movement of two-dimensional paper-based graphics in the seventies to the computer based three-dimensional color graphics of the eighties. Three-dimensional graphics have been achieved by kinematics displays where motion gives the depth cues and by stereoscopic displays. We have used both red-green stereo and polarized-light stereo to good effect. However, as satisfying as these displays are, they clearly represent the paradigm of a scientific investigator looking at a screen. What we are doing now is to leave this scenario and immerse the scientific data analyst in a data world. Allowing the analyst to literally move about in the data world, to fly around the data, to look at different portrayals of the data, to make a turn and literally turn into another

dimension seamlessly. We would imagine a *direct manipulation* setting where an analyst can actually grab hold of a data point in this virtual world and see the effect of moving it around. We would imagine a *progressive disclosure* setting in which, as the analyst approached a data point in this virtual data world, the numerical value or other attributes of the data point would come into focus. What we are proposing is to create a data analysis environment where the scientist could quite literally explore the data much the same way that an oceanographer with scuba gear or a submersible could explore the sea.

Indeed, this undersea exploration analogy is a good one. To understand the potential impact, one can imagine an oceanographer who wishes to explore the ocean. On the one hand, the oceanographer could create a remotely piloted vehicle with a television and light system and watch the exploration process on a video monitor within a darkened room in his ship. This is to a large extent what computer-based visualization does now. A second model might be called the *scuba divers model*. In this model, the oceanographer straps on a scuba tank and other associated gear, dives in the water and explores the ocean directly. This is a qualitatively different experience and has historically yielded a different type of result. A third model we might call the *aquarium model*. The scuba divers model obviously has the handicap of being encumbered with clumsy equipment and such distracting concerns as running out of air. The data analytic analog has the same kind of concerns with wearing a tethering helmet apparatus with limited visual resolution. The aquarium model is an intermediate stage and is analogous to visiting an aquarium with a 40 foot glass wall. We have implemented a 20 foot stereoscopic projection system which will allow the data analyst to view the data through a very large window unencumbered by requirements to wear physical hardware.

Conceptually what we wish to develop is easy to grasp. We are proposing a human-computer interface system which will allow the human operator control of his or her motion through the virtual data world simply by movement of an instrumented hand or controller. The binocular visual and binaural audio headgear will also be equipped to sense position and motion. The computations to update views are, in principle, straightforward three-dimensional Euclidian geometry computations. The basic limitations tend to be the accuracy and resolution of the input devices and the throughput of the rendered images. Systems that use a high-powered graphics workstation for each eye still run below 30 frames a second for complex images.

The popular version of immersive technology typically is built around a helmet system which incorporates stereoscopic video, binaural audio and position and motion sensors. The technological weakness of these systems is two-fold. Because of the close proximity of eyes and other sensitive organs, the use of CRT displays seems inadvisable. Most helmet systems have been based on liquid crystal technology which has severe limitations on visual resolution. A second issue for such systems is the latency of response to the motion sensing. There are numerous anecdotal reports on nausea induced by the latency. Both of these problems are technological problems which can be expected to be improved in the future. We have somewhat preferred the stereoscopic projection system as an immersive technology because it is currently capable of a much higher resolution, and, using a six degree of freedom controller, capable of steering the image with much less latency. The effect is that the room essentially becomes a vehicle with a portal to the virtual environment. Both of these immersive technologies offer positive and negative aspects, and both will be explored in the context of this present proposal. Indeed, we envision the situation that both can be used simultaneously by different individuals in the same virtual environment.

3. Visualization using the Grand Tour

In much of the work on visualization for data analysis, spatial extension is considered only as an abstract representation of a data variable, but not as any real entity. Although we had been (and still are) interested in representation and visualization of multivariate data, it is clear then there are many circumstances in which it is appropriate to measure variables in a spatial or volumetric setting. Consider, for example, the setting in which we take images of a minefield in eight spectral bands. This is an example of spatially extended multivariate data. At each pixel location, we have eight-dimensional multivariate data corresponding to the intensity levels of light in each of the eight spectral channels. A minefield may be two-dimensionally extended (spatially extended) in the case of land mines. A MRI medical image, by contrast, would be an example of a volumetrically extended application. Here we are concerned with a truly volumetric setting in which multiple sensors may give us partial information about tumor site targets. Again each voxel has a multidimensional vector attached to it which may have many missing observations. This MRI scenario extends in an obvious way to a EW electromagnetic environment as well as to other potential civilian applications.

The goal then is to combine the information in the multivariate vector attached to each pixel or voxel in such a way as to make the objects of interest visually most apparent. There are several potential approaches we would like to try. Some simple ones are: 1) to use different channels (i.e. vector components) for each eye to give a pseudo stereo effect and 2) to display each of the channels in rapid sequence so as to create a scintillation effect. (We have already employed this technique in the data analysis setting to good effect.) Both of these techniques, while potentially effective, are unlikely to be usable on a sustained basis because of the eye strain and fatigue they are likely to cause. A more sophisticated approach is the one-dimensional grand tour idea.

To understand the grand tour concept, let us consider a point, $\underline{x} = (x_1, \dots, x_d)$, in d -dimensional space. This point \underline{x} is the multivariate vector attached to each pixel or voxel location. For simplicity of exposition, we have suppressed the subscripts identifying the pixel or voxel location. We wish to visualize points of this form. Indeed, we wish to visualize a collection of such points, say, of size n of the form $\underline{x}_j = (x_1^j, \dots, x_d^j)$, $j = 1, 2, \dots, n$ where n is the total number of pixels or voxels under consideration. A simple device for doing this is the grand tour. The grand tour concept is built around the idea of looking at an object from all points of view, or more precisely, in all frames of reference. The original work of Asimov (1985) constructed all possible orientations of two-dimensional planes and, then, viewed the data as being projected into those two-planes. The key element of Asimov's grand tour is to have a continuous, space-filling path through the manifold of two-planes. Wegman (1991) considered a continuous, space-filling path through the manifold of d -planes in order to construct the d -dimensional grand tour. However, it is not difficult to imagine constructing a continuous, space-filling path through the manifold of one-planes (straight lines in d -space).

In order to construct the one-dimensional grand tour, we wish to consider $y_{jt} = \underline{a}_t \underline{x}_j$ where \underline{a}_t is a unit vector, that is, we take $\underline{a}_t = (a_{1t}, a_{2t}, \dots, a_{dt})$, $t > 0$ as a vector for which

$$\|\underline{a}_t\|^2 = \sum_{j=1}^d a_{jt}^2 = 1 \text{ for every } t.$$

Moreover, it must be the case that, as t ranges over the positive reals, \underline{a}_t ranges over all possible unit vectors. We wish to have \underline{a}_t be a continuous function of t and exhaust all possible unit vectors, that is, all possible orientations of the unit vector. The dot product, $y_{jt} = \underline{a}_t \underline{x}_j$ yields the projection of the \underline{x}_j data vector into the one-

dimensional manifold spanning the unit vector \underline{a}_t . According to the traditional view of a grand tour, we plot y_{jt} on a fixed one-dimensional coordinate system for time, t increasing. This is the *movie* view.

The grand tour in two dimensions has the same basic set up as in the one-dimensional case except we also define a second vector

$$\underline{b}_t = (b_{1t}, b_{2t}, \dots, b_{dt}), t > 0$$

where \underline{b}_t is a unit vector such that $\underline{a}_t \cdot \underline{b}_t = 0$ for every t , that is, \underline{a}_t and \underline{b}_t are orthonormal. Next let $y_{jt}^1 = \underline{a}_t \cdot \underline{x}_j$ and $y_{jt}^2 = \underline{b}_t \cdot \underline{x}_j$. Here we plot y_{jt}^2 versus y_{jt}^1 in a fixed two-dimensional coordinate system with time, t , increasing. Again, this is the *movie* view.

We are proposing, then, to use the one-dimensional grand tour idea at each pixel or voxel location. With this device we can examine a continuous series of orthogonal linear combinations of the data at each pixel. We would use the same grand tour at each pixel location so that as we moved through the grand tour, we would discover an optimal combination of the components of the data vector which maximally discriminated background from mines. It is clear that we would need a computationally efficient technique. For this purpose we intend to explore pseudo grand tour plots.

Consider now the d -dimensional data vector $\underline{x} = (x_1, \dots, x_d)$. If d is not even, augment \underline{x} by one additional 0 so that $\underline{x} = (x_1, \dots, x_d, 0)$. We may assume without loss of generality that d is even. Define,

$$\underline{a}'_t = (\sin(\omega_1 t), \cos(\omega_1 t), \dots, \sin(\omega_{d/2} t), \cos(\omega_{d/2} t)).$$

Then

$$\|\underline{a}'_t\|^2 = \sum_{j=1}^{d/2} (\sin^2(\omega_j t) + \cos^2(\omega_j t)) = d/2.$$

Hence, we rescale by $\sqrt{2/d}$, let $\underline{a}_t = \sqrt{2/d} \underline{a}'_t$ which implies $\|\underline{a}_t\| = 1$. For technical reasons, ω_i and ω_j are chosen so that the ratio ω_i/ω_j is irrational for every pair (i, j) and, moreover, no ω_i/ω_j is a rational multiple of any other ω_k/ω_m , $i \neq k$ and $j \neq m$. We know that

$$\cos(\omega_j t) = \pm \sqrt{1 - \sin^2(\omega_j t)}$$

so the scaled vector, \underline{a}_t , will not exhaust all possible orientations and, hence, will yield only a pseudo grand tour.

This same idea can be extended to two dimensions in order to construct a pseudo grand tour in two-dimensions. Let

$$\underline{b}'_t = (\cos(\omega_1 t), -\sin(\omega_1 t), \dots, \cos(\omega_{d/2} t), -\sin(\omega_{d/2} t)).$$

As before

$$\|\underline{b}'_t\|^2 = \sum_{j=1}^{d/2} (\cos^2(\omega_j t) + \sin^2(\omega_j t)) = d/2.$$

Hence we let

$$\underline{b}_t = \sqrt{2/d} \underline{b}'_t \text{ which implies } \|\underline{b}_t\| = 1.$$

Moreover, by this construction, we have

$$\underline{a}_t \underline{b}_t = \sum_{j=1}^{d/2} \frac{2}{d} (\sin(\omega_j t) \cos(\omega_j t) - \sin(\omega_j t) \cos(\omega_j t)) = 0.$$

Thus \underline{a}_t and \underline{b}_t are orthonormal vectors for every $t > 0$. Let $y_{jt}^1 = \underline{a}_t x_j$ and $y_{jt}^2 = \underline{b}_t x_j$. Plotting y_{jt}^2 versus y_{jt}^1 for every j as t ranges over positive reals yields the two-dimensional pseudo grand tour.

The grand tour is aimed at finding a useful combination of the multivariate vector components. In the classical approach to the grand tour, the resulting combination of vector components is viewed through a dynamic display. Wegman (1991) and Wegman and Shen (1993) explain how this can be done in the general d -dimensional setting and the 1-dimensional settings respectively. For the multispectral image setting, we have in mind the following technique. In the above formulation, the j subscript refers to the indexing of the pixels. Notice that the grand tour vector, \underline{a}_t , does not depend on the pixel. We have in mind doing the same grand tour for every pixel. The image undergoing the grand tour would be displayed in grey-scale or some appropriate color scale (subject to appropriate psychometric experimentation). We propose allow the grand tour to continue until there is a combination of terms which allows the targets (mines) to be visually represented in a way significantly differently from the background clutter. As indicated earlier, the immersive technology would allow us to superimpose the grand-tour derived image on the real scene so that the US forces could navigate through mine field with great confidence.

4. Pattern Recognition using Recursive Functional Inference

The grand tour is a dynamic visualization technique aimed at finding an optimal combination of the raw data. The grand tour is essentially a pixel by pixel (voxel by

voxel) processor. In many settings, particularly those with heavy noise components, a local pixel by pixel process may not be adequate. In such cases, a pattern recognition processor may be necessary. In the following paragraphs, we describe a general pattern recognition algorithm.

For illustrative purposes, let us consider one of the simplest cases, the two class discrimination problem. In this setting, we have two distinct classes of objects, one lets say is the mine and the second is the general background clutter. Clearly we wish to discriminate the mine from the general background clutter. Images of interest may contain noise and so, even with techniques such as the grand tour, their ability to discriminate may not be clear cut especially when the data comes from highly non-normal distributions. Suppose that $f_1(x)$ is the probability density associated with the pixels corresponding to mines and $f_2(x)$ is the probability density associated with the general background clutter. Presumably $f_1 \neq f_2$. If they were equal, then from a statistical point of view mines and background clutter would be indistinguishable. One can construct a discriminant function in several different ways. Consider, for example

$$D_0(x) = \log\left(\frac{f_1(x)}{f_2(x)}\right)$$

as one possible discriminant function or

$$D_1(x) = \pi_1 f_1(x) - \pi_2 f_2(x)$$

as another. The first discriminant function is the log likelihood ratio discriminant function while the second one is a formulation of a Bayes discriminant function (see Priebe and Marchette, 1991). Thus given a pixel value, ξ , we apply the decision rule as follows:

Decide Class 1 if and only if $D_i(\xi) \geq 0$

and

Decide Class 2 if and only if $D_i(\xi) < 0$.

The discriminant analysis is based on the unknown densities. Thus we need a computationally efficient density estimation procedure in order to implement such a discriminant analysis.

Let us emphasize two aspects of the desired requirements for the density estimation. Procedures applied to images must be computationally efficient. They

must also be efficient with respect to storage. Consider images which are of relatively modest resolution, say 512×512 , but becoming available at standard video rates of say 30 frames per second. This means we are dealing with $2^{18} \times 30 = 7,864,320$ pixels per second. Thus procedures must be fast and must not demand that all values be stored. We propose density estimation procedures that are adaptive and that are recursive. We explain both in turn.

A standard formulation of a density estimation procedure based on n unknown observations, say x_1, \dots, x_n is the standard kernel estimator

$$\hat{f}(x) = \frac{1}{nh_n} \sum_{j=1}^n K\left(\frac{x-x_j}{h_n}\right).$$

Much has been written about this estimator. Two observations are clear. First, in our simple example $n = 2^{18}$, so that computation of even one density estimate may require a summation with 262,144 terms. This represents a high degree of computational complexity. An estimator requiring say 5 to 30 terms would be much more desirable. Moreover, as new observations (images) became available, the present formula would require a complete recomputation using all of the data. Thus, all of the data would have to be available. Wolverton and Wagner (1969) introduced a recursive formulation which was later studied by Wegman and Davies (1979). In this formulation,

$$\hat{f}_n(x) = \frac{1}{n} \sum_{j=1}^n \frac{1}{h_j} K\left(\frac{x-x_j}{h_j}\right),$$

which can be recursively formulated as

$$\hat{f}_n(x) = \frac{n-1}{n} \hat{f}_{n-1}(x) + \frac{1}{h_n} K\left(\frac{x-x_n}{h_n}\right).$$

Thus to update the estimator only the most recent observation is required. Priebe (1993) carried this idea even further by formulating an adaptive normal mixtures algorithm. He considers a general estimator of the form

$$(4.1) \quad \hat{f}_n(x) = \sum_{j=1}^N \pi_j \phi(x; \mu_j, \sigma_j)$$

where ϕ is a normal density with means, μ_j , and standard deviations, σ_j and π_j is estimated from the data, x_1, \dots, x_n . We let $\phi_j(x) = \phi(x; \mu_j, \sigma_j)$. The number of terms,

N , is variable and depends on the data. A recursive updating formula can be given as follows:

$$\begin{aligned}
(4.2) \quad \rho_j^{(n+1)} &= \pi_j^{(n)} \frac{\phi_j(\mathbf{x}_{n+1})}{\hat{f}_n(\mathbf{x}_{n+1})} \\
\pi_j^{(n+1)} &= \pi_j^{(n)} + \beta_j^{(n)}(\rho_j^{(n+1)} - \pi_j^{(n)}) \\
\mu_j^{(n+1)} &= \mu_j^{(n)} + [\pi_j^{(n)}] - 1 \beta_j^{(n)} \{ \mathbf{x}_{n+1} + \mu_j^{(n)} \} \\
\sigma_j^{2(n+1)} &= \sigma_j^{2(n)} + [\pi_j^{(n)}] - 1 \beta_j^{(n)} \rho_j^{(n+1)} \{ (\mathbf{x}_{n+1} - \mu_j^{(n)})^2 - \sigma_j^{2(n)} \}
\end{aligned}$$

and

$$\beta_j^{(n)} = \frac{1}{n}.$$

Here the subscript j refers to the j th term of the normal mixture formula, (4.1). The rule (4.2) is called the *update rule*. This recursive formulation alone is inadequate since the number of terms is fixed at N as presently constructed. This formulation is not adequate for data not distributed as a normal mixture and may even be inadequate in the case that the real number of mixture terms is larger than N . The problem is that the number of terms, N , must grow as the sample size, n , increases. A create rule can also be constructed as follows:

$$\begin{aligned}
\mu_{N+1}^{(n+1)} &= \mathbf{x}_{n+1} \\
\sigma_{N+1}^{(n+1)} &= \sigma^0 \\
\pi_j^{(n+1)} &= \pi_j^{(n)} [1 - \beta_j^{(n+1)}], j = 1, 2, \dots, N
\end{aligned}$$

and

$$\pi_{N+1}^{(n+1)} = \beta_{N+1}^{(n+1)}.$$

Of course, now (4.1) would have $N+1$ terms.

An interesting additional research issue is to extend this recursive, data-adaptive formulation to the general nonparametric function estimation framework. In this general setting, we consider optimizing a general convex functional, say $\mathcal{L}(f)$, for $f \in \mathcal{M} \subseteq \mathcal{H}$, a

Hilbert space. Wegman (1993) shows that a computational algorithm can be formulated as

$$(4.3) \quad f(x) = \sum_{j \in J} \hat{c}_j \psi_j(x)$$

where ψ_j form an orthonormal basis for the Hilbert space. The form of (4.1) and (4.3) is very close and one expects that the solution to the density estimation problem formulated in (4.1) can be extended to the general function estimation problem of (4.3).

This density-based approach to pattern recognition just outlined has several advantages when there is sufficient data to drive the density estimation procedures (this is normally the case). The nonparametric technique based on adaptive mixture models (Priebe and Marchette, 1991, 1993) retains the full nonparametric power of the classic kernel estimator, but increases in complexity at only a logarithmic rate. This slower rate allows the use of extremely large data sets. The adaptive mixture probability density function model can be built up either using a batch EM type algorithm or, as outlined here, by using a recursive update formulation. The former approach is appropriate for small data sets while the recursive approach is most useful for very large data sets and for nonstationary distributions. Both approaches are optimal in the sense of yielding unbiased estimates which are asymptotically convergent. A second advantage is that a change in prior class probabilities requires no retraining since it is accommodated by the likelihood ratio procedure.

As in the case of the grand-tour techniques, the pattern recognition techniques just described allow for a more computationally intensive, statistically-based means for identifying candidate mines. In the grand-tour methods we suggested a grey-scale display of the resulting grand-tour pixels, i.e. what we identified above as y_{jt}^1 . In the pattern recognition context, we would likely use a grey-scale display of the discriminant function $D_i^j(x)$ where $i = 1$ or 2 and j is the index corresponding to the pixel location. An alternative approach would be to set a threshold say d_α and report those locations for which $D_i^j \geq d_\alpha$ as potential mine sites. The locations identified as potential mine sites would be highlighted and mapped onto an image of the real scene. The immersive display could be through either head mounted display or through a stereographic projection system. In either case, the viewer would have a highly realistic display of the surrounding environment, but with danger zones identified and highlighted.

5. Project Task Areas

There are three major areas in which we would like to make contributions: 1) Algorithmic/Geometric, 2) Computational and 3) Psychometric. Geometric modeling is obviously a key part of the creation of a virtual environment. Traditionally there are three major approaches used in computer graphics: 1) wire frame, 2) b-spline and related polynomial interpolation techniques and 3) standard geometric forms. Wire frames are widely used in 3-dimensional modeling whereas geometric forms (right cylinders, spheres, cubes, cones, conic sections of revolution, etc.) are frequently used in CAD-CAM applications. Rendering with lighting and shading models as well as transparency requires computation of surface normals and gradients. We have found these effects, e.g. lighting, rendering, and transparency, to be enormously helpful even in the scientific visualization of abstract mathematical structures. Wireframe models generally require a numerical approximation to compute surface normals and gradients whereas while geometric forms usually have specific parametric forms for surface normals and gradients, they lack ability to represent arbitrary forms and still require approximations at the junctions of two standard geometric forms.

Task 1: We propose to investigate linear approximation models to general two- and three-dimensional geometric structures. These would include convolution smoothers, orthonormal function approximation (e.g. using wavelets and other basis functions) and related recursive linear algorithms. Linear surface approximation algorithms such as those just mentioned have the benefit that the partial derivatives of surfaces can be evaluated term-wise so that gradients and surface normals can be evaluated analytically in closed form. The closed form evaluation should dramatically speed up computation. The exact analytic computation means a coarser grid may often be used since the fine grid is not needed for the approximation. We have shown these effects already for certain statistical function approximations but have not yet extended these to general surface representations.

Task 2: Visualizing multivariate data is a difficult task in general. Visualizing spatial or volumetric multivariate data is even more difficult since most of the currently available visualization tools use spatial extension as a plotting device. We propose to investigate the one-dimensional grand tour as a device for spatially distributed data. The grand tour was originally framed as a method for projecting multidimensional data

into a continuously moving two-dimensional coordinate system. Assuming the moving two-dimensional coordinate system would rotate smoothly through all possible two-dimensional coordinate systems, the data analyst would have a chance to look for unusual configurations. The general rotation of the two dimensional coordinate systems was, in effect, a device for examining all possibly orthonormal linear combinations of the multivariate data. Work at GMU extended this notion to arbitrary dimensions and also to one dimension. In one dimension, the normalized linear combination could be coded in gray scale. If the same one-dimensional grand tour is carried out for every pixel or every voxel, then a smoothly changing two- or three-dimensional image results in which certain linear combinations may optimally show up targets of interest.

Task 3: We propose to investigate the use of nonparametric, recursive methods as devices for visualization of spatially and volumetrically distributed multivariate data. This is to include the following cases:

1) Static: multiple classes are each represented by stationary distributions. The class at each pixel or voxel is static.

2) Change Point: multiple classes are each represented by stationary distributions. The class at each position is subject to change resulting in a change point detection and display problem.

3) Nonstationary: multiple classes each represented by nonstationary distributions.

Task 4: Speed has often been a major factor in the effectiveness of virtual environments. Speed effects come from both millisecond lag of position sensors for head-mounted display systems and from inherent (microsecond?) slowness of the computers in being able to calculate and render appropriate scenes. We are proposing to link our Intel Paragon through direct HiPPI channel to the rendering engines in our Silicon Graphics systems. This will bring to bear a 4.2 gigaflop machine dedicated to the virtual environment computation and should, in effect, remove computer slowness as a factor. We are proposing two basic immersive techniques: 1) the head mounted displays and 2) stereoscopic projection displays. We prefer the latter as a current technology for several reasons: 1) it is currently capable of much higher spatial and stereoscopic resolution, 2) it can be controlled by an essentially zero-time lag six degree of freedom controller rather than a slower magnetic sensor, 3) it can in effect turn the

room into a vehicle capable of navigating the virtual environment and 4) it can perhaps replicate a motion sense as with the early Cinerama or current IMAX movie environments. We believe the high performance parallel computing/graphics computer/stereoscopic display combination will make an extremely effective virtual environment. We will have the capability to effectively compare the stereo projection display and head-mounted display technologies. This task is principally oriented to integrating computer architectures into an effective virtual environment.

Task 5: In addition to the above indication of comparison of immersive techniques, there are fundamental issues related to stereoscopic displays. The parallax effect is one notable effect we seek to explore. Stereo on a 19 inch display assumes certain parameters about distance from screen and image displacement for left eye-right eye. For a 19 inch display, the viewer's face is relatively close to the screen so focal accommodation becomes a potential problem (i.e. the eyes must focus on the screen at a fixed distance, but the parallax accommodation sends a conflicting perceptual cue, namely the eyes are more crossed than they should be for certain depth effects). On a 15 foot display such as we are operating, focal accommodation is less of a problem since eyes are operating at distances where depth of field is better, but disparity between left eye and right eye images may be greater than distance between eyes forcing eyes not to converge, but to diverge in order to fuse images. This is known to be an unnatural effect. The speed with which an individual is able to fuse an image depends on parallax and some careful studies seem warranted in the virtual environment setting. Most of the information currently available seems heuristically derived at best, and much of it inconsistent with our experience.

6. Virtual Reality and Computing Facilities

The virtual reality facilities at the Center for Computational Statistics at George Mason University have been under active development for just over 18 months. The computer suite used directly in support of the virtual environments facility includes a Silicon Graphics Power Series 4D/120/GTX, a Silicon Graphics Indigo R4000 Elan and a Silicon Graphics Crimson VGXT. In addition tied into our Silicon Graphics network are 3 Silicon Graphics Indigo R4000 XS24 machines with z-buffers, 9 Silicon Graphics R4000 XS24 machines and one Silicon Graphics Indigo for a total of 16 machines. There are several additional Hewlett-Packard machines on our network as well as 15 NeXT

machines. The machines are configured in a TCP/IP ethernet running yellow pages and NFS. The total hard drive capacity for the Silicon Graphics machines exceeds 10.8 gigabytes while the remaining UNIX machines add another 7.1 gigabytes for a total storage capacity on-line in excess of 17.9 gigabytes. The highest performance graphics engine is currently the VGXT engine in our SGI Crimson.

The virtual reality laboratory, known locally as the *Holodeck* after the facility on the Star Trek: The Next Generation TV series, contains a head mounted display system by Virtual Research, Inc. The position sensing of both head and hand is accomplished with Ascension Technology's Flock of Birds Sensors. The conversion from RGB high resolution computer display to NTSC is accomplished with a two channel encoder/decoder. Our present setup requires the use of a Crimson VGXT for one eye and the Indigo Elan for the other. We have also installed a Stereographics high resolution projection system. This device is capable of 1280x1024 resolution and projects an approximately 20 foot diagonal image. It is driven by the SGI machines and is capable of stereoscopic projection using Stereographics' Crystal Eyes technology. We own seven Crystal Eyes' active stereo glasses including one which contains an acoustic position sensor.

We have had long experience with parallel computing (since 1987). We currently operate an Intel iPSC/2 d4/VX concurrent computer with 16 compute nodes capable of approximately 320 megaflops peak speed. We have taken delivery of an Intel Paragon A4 concurrent computer with 56 compute nodes capable of a peak speed of 4.2 gigaflops. Both of these machines will be tied into the virtual reality labs, and as outlined in the proposal, we expect to use these machines as compute engines for our virtual environments research. In addition to the visualization capability just described, we will have a five channel audio subsystem featuring S-VHS and laser disk capability supported by a NeXT computer with DSP capabilities. We anticipate both sound and speech synthesis and voice recognition capabilities will exist in the virtual reality lab. The virtual reality laboratory also contains two color printers, one a Mitsubishi-Shinko dye sublimation printer, the other a Hewlett-Packard ink jet printer. The facilities described are supported by two full-time computer engineers and a full-time administrative assistant. The support staff reports to the proposed principal investigator and so continuous, professional maintenance for the computers, peripheral equipment, video and audio facilities.

7. Results of Previously Funded Work by ARO

The previous ARO-funded project began in 1991 and has been very productive in several senses. First as a research project, we have produced a large number of publications that cite funding from ARO. The list is given below:

Le, H. T. and Wegman, E. J. (1991), "Generalized function estimation of underwater transient signals," *J. Acoust. Soc. America*, 89, 274-279.

Miller, J. J. and Wegman, E. J. (1991), "Construction of line densities for parallel coordinate plots," *Computing and Graphics in Statistics*, (A. Buja and P. Tukey, eds.), 107-123, Springer-Verlag: New York.

Wegman, E. J. (1991), "A stochastic approach to load balancing in coarse grain parallel computers," in *Computing and Graphics in Statistics*, (A. Buja and P. Tukey, eds.), 219-230, Springer-Verlag: New York.

Xu, Mingxian, Miller, J. J. and Wegman, E. J. (1991), "Parallelizing multiple linear regression for speed and redundancy: an empirical study," *J. Statist. Comput. Simul.*, 39, 205-214.

Wegman, E. J. (1991), "The grand tour in k-dimensions," *Computing Science and Statistics: Proceedings of the 22nd Symposium on the Interface*, 127-136.

Hearne, L. B. and Wegman, E. J. (1991), "Adaptive probability density estimation in lower dimensions using random tessellations," *Computing Science and Statistics: Proceedings of the 23rd Symposium on the Interface*, 241-245.

Wegman, E. J. (1992), "Introduction to Box and Jenkins (1962) Some statistical aspects of adaptive optimization and control," *Breakthroughs in Statistics, Volume II*, (S. Kotz and N. Johnson, eds.), 361-368, Springer-Verlag: New York.

Wegman, E. J. and Le, H. T. (1992), "Moments and wavelets in signal estimation," in *Moments and Signal Processing*, (Purdue, P. and Solomon, H., eds.), Monterey, CA: Naval Postgraduate School, 270-294.

Wegman, E. J. and Habib, M. K. (1992), "Stochastic methods for neural systems," *J. Statistical Planning and Inference*, 33, 5-26.

Hearne, L. B. and Wegman, E. J. (1992), "Maximum entropy density estimation using random tessellations," *Computing Science and Statistics*, 24, 483-487.

Le, H. T. and Wegman, E. J. (1993), "A spectral representation for the class band-limited functions," to appear, *Signal Processing*.

Wegman, E. J., Carr, D. B. and Luo, Q. (1993), "Visualizing multivariate data," in *Multivariate Analysis: Future Directions*, (Rao, C. R., ed.), Amsterdam: North Holland, 423-466.

Wegman, E. J. and Carr, D. B. (1993), "Statistical graphics and visualization," in *Handbook of Statistics 9: Computational Statistics*, (Rao, C. R., ed.), Amsterdam: North Holland, 857-958.

Wegman, E. J. (1993), "Wavelets and nonparametric function estimation," to appear *J. American Statistical Association*.

Wegman, E. J. and Shen, J. (1993), "Three-dimensional Andrews plots and the grand tour," to appear, *Computing Science and Statistics*.

In addition to the publications, we have been active in technology transfer in several ways. In September of 1992, I gave a short course on Statistical Graphics and Visualization at BRL. In addition, I have been very active in representing ARO at a number of ARO sponsored workshops including several Design of Experiment Conferences and a number of workshops held in the Research Triangle Park. I have also visited the Army SECOM and briefed Major General Guenther and his staff on our ARO sponsored research.

Budget

It should be noted that the overhead rates at GMU are an unusually low 47% on salaries only. This makes contracts with George Mason attractive since a higher percentage of funds are allocated to direct charges. We are asking a small amount of clerical expenses since these are not covered by our indirect charges. Because of the complexity of our computing system and the fact that we handle maintenance internally, administrative assistance is crucial to the functioning of our projects.

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- Priebe, C. E., and D. J. Marchette (1993), "Adaptive mixture density estimation." *Pattern Recognition*, 26(5), 771-785.
- Wegman, E. J. (1991), "The grand tour in k-dimensions," *Computing Science and Statistics*, 22, 127-136.
- Wegman, E. J. (1993), "Wavelets and nonparametric function estimation," to appear *J. American Statistical Association*.
- Wegman, E. J. and Davies, H. I. (1979), "Remarks on some recursive estimators of a probability density," *Annals of Statistics*, 7, 316-327.
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- Wolverton, C. T. and Wagner, T. J. (1969), "Asymptotically optimal discriminant functions for pattern classification," *IEEE Trans. Information Theory*, IT-15, 258-265.

Resume of the Principal Investigator

George Mason University

PERSONAL DATA OF
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(Prepared November, 1993)

BORN: July 4, 1943
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Katherine Dawn (July 6, 1980)

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EDUCATION:

Epiphany of Our Lord Grammar School and William Cullen
McBride High School (Both St. Louis, MO)
1961 Entered St. Louis University with 4 year full tuition scholarship.
1965 Graduated B.S. in mathematics with honors. Entered the
University of Iowa, Department of Statistics with NDEA
Fellowship
1967 Awarded M.S. in mathematical statistics
1968 Awarded Ph.D. for dissertation, On Estimating a Unimodal Density
under the direction of Professor Tim Robertson

SOCIETY MEMBERSHIPS

American Statistical Association
Institute of Mathematical Statistics
Royal Statistical Society
International Statistical Institute
Mathematical Association of America
Society of Industrial and Applied Mathematics
American Mathematical Society
Institute of Electrical and Electronic Engineers
Sigma Xi Research Society
American Association for the Advancement of Science

CONTRACTS

Research Associate with Professor George Nicholson on both AFOSR and NSF Grants, 1969, 1970
Research Associate with Professor R. C. Bose on NSF Grant GP-23520, 1971, 1972
Research Associate with Professors W. L. Smith and M. R. Leadbetter on ONR contract, 1973, 1974
Principal Investigator on AFOSR contract, 1975-1977, 1987-1989
Senior Faculty Fellow Award from NSF, 1976
Principal Investigator on ARO contract, 1987-1993
Principal Investigator on NSF grant, 1987-1993
Principal Investigator on a Virginia CIT contract, 1987-1990
Principal Investigator on an IBM equipment grant, 1987
Principal Investigator on an Apple Computer, Inc. equipment grant, 1987
Principal Investigator on DoD Instrumentation grant, 1988, 1989
Principal Investigator on ONR contract, 1989-1994
Principal Investigator on NSF Screms grant, 1990, 1992

AWARDS AND HONORS

Elected Fellow of the Royal Statistical Society, 1977
Elected Fellow of the American Statistical Association, 1979
Elected Fellow of the Institute for Mathematical Statistics, 1981
Elected Senior Member of the Institute of Electrical and Electronic Engineers, 1979
Elected Member of the International Statistical Institute, 1983
Selected by the Washington Academy of Science as the 1983 Outstanding Mathematician
in the Washington, DC area and elected Honorary Fellow, 1983
Elected Fellow of the American Association for the Advancement of Science, 1985
Awarded the U. S. Navy Meritorious Civilian Service Medal, 1981
Awarded the U. S. Navy Merit Pay Performance Award, 1981
Awarded the U. S. Navy Merit Pay Performance Award, 1982
Awarded the U. S. Navy Special Achievement Award, 1983
Promoted to the U. S. Senior Executive Service, 1983
Awarded the U. S. Navy Senior Executive Bonus Award, 1984
Selected as the first Bernard J. Dunn Professor of Information Technology and Applied Statistics,
George Mason University, 1986
Elected President-elect of the Washington Statistical Society, 1989
Elected Vice-President of the Intel Supercomputer User's Group, 1990
Awarded the George Mason University Distinguished Faculty Award, 1990

EMPLOYMENT

Assistant Professor, University of North Carolina, Department of Statistics, 1968-1973
Associate Professor, University of North Carolina, Department of Statistics, 1973-1978
Visiting Professor, University of Manchester (England), Department of Mathematics (on leave
from the University of North Carolina), 1976-1977
Director, Statistics and Probability Program, Office of Naval Research, 1978-1983
Head, Mathematical Sciences Division, Office of Naval Research, 1982-1986
Professor and Director, Center for Computational Statistics, George Mason University, 1986-

RESEARCH INTERESTS

Computational Statistics
Time Series Analysis
Function and Curve Estimation including Splines
Inference under Order Restrictions
Parallel Computing

PROFESSIONAL ACTIVITIES

CONSULTING ACTIVITIES

Naval Coastal Systems Laboratory, Panama City, FL: data analysis of high frequency sonar data, 1973, 1974

North Carolina State Utilities Commission, Raleigh, NC: design and analysis of survey to assess the impact of a proposed Duke Power rate hike on low income customers, 1974

Governor James Hunt, Raleigh NC: assessment and analysis of a controversial report published by the North Carolina State Department of Public Instruction concerning the effect of state-supported kindergarten on third grade performance, 1975

American Rose Society, Shreveport, LA: design and analysis of a national survey to rate rose cultivars, 1975

North Carolina State Department of Public Instruction, Raleigh, NC: design, stratification and selection of a sample to assess performance of pupils statewide, 1976, 1977

Executive Office of Management and Budget (under Presidents Carter and Reagan), Washington, DC: review of sampling procedures for reporting faculty workload under OMB Circular A-21, 1980, 1981

Department of Statistics, Ohio State University, Columbus, OH: teaching of statistics for industrial and government service, 1981-1985

Strategic Defense Initiative Organization, Innovative Science and Technology Office, Washington, DC: development of the ultra high speed computing research program, 1985-1986

J. S. Lee and Associates, Inc., Arlington, VA: hyperspace methods in communication theory, 1986

MEETINGS OR SESSIONS ORGANIZED

One of three principal organizers of the NSF-sponsored Regional Conference on Multiple Time Series and Systems Identification, January 2-6, 1973, Chapel Hill, NC Principal Speaker: E. Parzen

Co-organized Workshop on the Design and Analysis of Statistical Experiments in Weather Modification, October, 1978, Tallahassee, FL with D. DePriest and R. Bradley

Co-organized Workshop on Robustness in Sonar Systems, November, 1978, Panama City, FL with Carl Bennett

Co-organized Workshop on Processes in Marine Remote Sensing, June, 1979, Manchester, England with F. P. Diemer

Co-organized IMS Special Topics Meeting on Splines and Approximations, October 1979, Boulder, CO with Grace Wahba

Member of Organizing and Editorial Committees of the International Meeting on Statistics in Tokyo (Statistical Methods and Data Analysis), November, 1979, Tokyo, Japan

Co-organized ONR-ARO Joint Workshop on Reliability in the Acquisitions Process, April, 1981, Washington, DC with D. DePriest and R. Launer

Member of the Executive Committee, 15th International Symposium on Remote Sensing, May, 1981, Ann Arbor, MI

Co-organized Workshop on Two-Dimensional Signal and Image Processing in Anti-Submarine Warfare, May, 1981, Woods Hole, MA with Theo Kooij and Art Bisson

Organized Workshop on Signal Processing in the Ocean Environment, May, 1982, Annapolis, MD

Organized Workshop on Statistical Image Processing and Graphics, May, 1983, Luray, VA

Member of the Organizing Committee of the Second International Meeting on Statistical Climatology, October, 1983, Lisbon, Portugal

Organized AAAS Symposium on Journeys into Higher Dimensions: Graphics in Mathematics, Statistics and Perception, May, 1984, New York, NY

Organized AAAS Symposium on Brains, Learning and Memory, May, 1984, New York, NY

Associate Program Secretary for the Institute of Mathematical Statistics, 1975-1984

Program Chairman, Institute of Mathematical Statistics Annual Meeting, August, 1986, Chicago, IL

Co-organized AAAS Symposium on Imprecision and Expert Systems, February, 1987, Chicago, IL with N. Singpurwalla

Organizer and Program Chairman of the joint ARO-GMU Workshop on Computational Statistics, June, 1987, Fairfax, VA

Program Chairman, 1988 Interface Symposium, April, 1988, Washington, DC

Co-organized, Workshop on New Directions in Statistics, November, 1990, Arlington, VA with Julia Abrahams

EDITORIAL

Member of the Committee for Statistical Tables for the Institute of Mathematical Statistics, 1970-1976

Member of the Editorial Board of Communications in Statistics, 1975-1987

Member of the Editorial Board of Statistics and Probability Letters, 1981-1987

Member of the Editorial Advisory Board of Naval Research Logistics Quarterly, 1982-present
Coordinating Editor of the Journal of Statistical Planning and Inference, 1983-present
Associate Editor of the Journal of the American Statistical Association, 1986-1988
Associate Editor of Computational Statistics and Data Analysis, 1986-present
Associate Editor of the Journal of Nonparametric Statistics, 1988-present
Editor (Theory and Methods) of the Journal of the American Statistical Association, 1990-1994

COMMITTEE ASSIGNMENTS

Member of the Membership Committee of the American Statistical Association, 1975-1978
Institutional Representative of the American Statistical Association to the American Association for the Advancement of Science, 1981-1984
Member of the Editorial Selection Committee for The American Statistician, 1982-1983
Section Secretary of AAAS Section U, 1983-1987
Member of the ASA Committee for Quality and Productivity, 1984-1986
Speech Writer for RADM J. Mooney, Chief of Naval Research, Special Invited Lecture, American Mathematical Society, January, 1985
Chairman of the Search Committee for the 1989 Editor for the ASA 150 Publication, 1986-1987
Member of the IMS Committee on the Selection of Administrative Officers, 1987-1989, Chairman, 1988-1989
Member of User's Group Advisory Committee for INTEL, 1987-1990
President-elect of the Washington Statistical Society, 1989, President, 1990-1991
Vice-President of the Intel Supercomputer User's Group, 1990
President/Treasurer of the Interface Foundation of North America, 1987-present
Member of ASA Committee on Publications, 1991

INVITED PAPERS

"Nonparametric probability density estimation," IMS Central Regional Meetings, Dallas, TX, April, 1970
"Some thoughts on computers and undergraduate statistics," Second International Congress on Mathematical Education, Exeter, England, August, 1972

"Some results on automata in random environments," International Symposium on Information Theory, Patras, Greece, August, 1976

"An automaton modeled in an environment," First International Conference on Mathematical Modeling, St. Louis, MO, August, 1977

"Splines and related functional estimators," Washington Statistical Society, Washington, DC, November, 1978

"Time series, sonars and space probes," Washington Statistical Society, Washington, DC, June, 1979

"Time series and remote sensing," Processes in Marine Remote Sensing Workshop, Manchester, England, June, 1979

"Isotonic splines," IMS Special Topics Meeting on Splines and Approximations, Boulder, CO, October, 1979

"Two approaches to nonparametric regression: splines and isotonic inference," International Conference on Statistics in Japan, Tokyo, Japan, November, 1979

"On computer architectures for statistical algorithms," Conference on Applications of Numerical Analysis and Special Functions in Statistics, College Park, MD, October, 1980

"Training statisticians for employment in industry and government, invited discussion," Conference on the Teaching of Statistics and Statistical Consulting, Columbus, OH, November, 1980

"Isotonic and related splines," Miniconference on Isotonic Regression, Iowa City, IA, April, 1981

"Data Fusion," Third International Conference on Statistical Decision Theory and Related Topics, West Lafayette, IN, June, 1981

"Maximum likelihood density estimation," Miniconference on Nonparametric Statistics, Lexington, KY, March, 1982

"Data fusion," Virginia Academy of Science Annual Meeting, Blacksburg, VA, April, 1982

"Spline estimation of spectral densities," Annual Meeting of the American Statistical Association, Cincinnati, OH, August, 1982

Invited Discussant at the ASA/Southern Regional Education Board Meeting, Arkadelphia, AR, June, 1984

"Higher dimensional data analysis," Keynote Talk, Symposium on Adaptive Inference in Honor of Robert V. Hogg's 60th Birthday, Iowa City, IA, October, 1984

Invited Discussant, ORSA Special Interest Conference on Statistical and Computational Problems in Probability Modeling, Williamsburg, VA, January, 1985

"Parallel coordinate representation of multivariate data," Washington Statistical Society, Washington, DC, March, 1985

"Ultra high speed computing," Software Valley, West Virginia, a Conference sponsored by (then) Senate Minority Leader Robert Byrd, Morgantown, WV, July, 1985

"Hyperdimensional data analysis using parallel coordinates," Washington Operations Research and Management Science Council, Washington, DC, January, 1986

"Representing multivariate meteorological data using parallel coordinates," Tenth AMS Conference on Weather Modification, Arlington, VA, May, 1986

"Hyperdimensional data analysis using parallel coordinates," Fourth International Conference on Statistical Decision Theory and Related Topics, West Lafayette, IN, June, 1986

"Hyperdimensional data analysis using parallel coordinates," AMS-IMS-SIAM 1986 Joint Research Conference on Large Scale Data Analysis via Computer Graphics, Santa Cruz, CA, July, 1986

"On randomness, determinism and computability," Conference on Assessing Uncertainty, Monterey, CA, November, 1986

"On randomness, determinism and computability," Washington Statistical Society, Washington, DC, January, 1987

"A Parallel coordinate approach to statistical graphics," NCGA Annual Conference and Exposition, Philadelphia, PA, March, 1987

"Computational statistics versus statistical computing," ARO-GMU Workshop on Computational Statistics, Fairfax, VA, June, 1987

"Impact of technology on statistics," Washington Statistical Society ASA Sesquicentennial Seminar, Washington, DC, September, 1988

"Parallel coordinate density plots," National Academy of Sciences/Board of Mathematical Sciences Chairman's Meeting, Washington, DC, October, 1988

"Parallel coordinate density plots," Army Design of Experiments Conference, Las Cruces, NM, October, 1988

"Parallel coordinate density plots," Computing Science and Statistics: 21st Symposium on the Interface, Orlando, FL, April, 1989

"Parallelizing multiple linear regression," Computing Science and Statistics: 21st Symposium on the Interface, Orlando, FL, April, 1989

"Parallel computing and statistics," (special sesquicentennial invited lecture) ASA Sesquicentennial Meeting, Washington, DC, August, 1989

"The grand tour in k-dimensions," Computing Science and Statistics: 22nd Symposium on the Interface, East Lansing, MI, May, 1990

"Visualization of high dimensional-structure using ridges," ASA Annual Meeting, Atlanta, GA, August, 1991

"Parallel computing in statistics" ISI Biennial Meeting, Cairo, Egypt, September, 1991

"Visualization of high dimensional structure using ridges," Keynote talk at ASA Milwaukee Chapter Special Meeting on Statistical Graphics, Milwaukee, WI, September, 1991

"Visualization of high dimensional structure using ridges," Washington Statistical Society, Washington, DC, September, 1991

"The straight scoop on wavelets," Army Design of Experiments Conference, Vicksburg, MS, October, 1991

PUBLICATIONS

BOOKS, SPECIAL ISSUES OF JOURNALS AND SOFTWARE

Statistical Analysis of Weather Modification Experiments, edited with D. DePriest, New York: Marcel-Dekker Press, Inc., 1980

Statistical Signal Processing, edited with J. Smith, New York: Marcel-Dekker Press, Inc., 1984

Quality Control: New Developments and Practice for Sampling Inspection, Special Issue of the Naval Research Logistics Quarterly, guest edited with G. C. McDonald, Vol 32, 1985

Statistical Image Processing and Graphics, edited with D. DePriest, New York: Marcel-Dekker Press, Inc., 1986

Brain Structure, Learning and Memory, edited with Joel L. Davis and Robert W. Newburgh, Boulder, CO: Westview Press, Inc. for the AAAS, Washington, DC, 1988

Topics in Non-Gaussian Signal Processing, edited with Stuart C. Schwartz and John B. Thomas, New York: Springer-Verlag, Inc., 1988

Assessing Uncertainty, Special Issue of the Journal of Statistical Planning and Inference, guest edited with H. Solomon, Vol. 20, No. 3, 1988

Computing Science and Statistics: Proceedings of the 20th Symposium on the Interface, edited with Donald T. Gantz and John J. Miller, Alexandria, VA: American Statistical Association for the Interface Foundation of North America, 1988

Stochastic Models of Biological Intelligence, Special issue of the Journal of Statistical Planning and Inference, guest edited with M. K. Habib and J. L. Davis, Vol. 33, No. 1, 1992

Mason Hypergraphics, copyright (c) 1988, 1989 by Edward J. Wegman and Masood Bolorforoush, a MS-DOS package for high-dimensional data analysis

PAPERS

"A note on estimating a unimodal density," *Ann. Math. Statist.*, 40, 1661-1667, 1969

"Maximum likelihood estimation of a unimodal density function," *Ann. Math. Statist.*, 41, 457-471, 1970

- "Maximum likelihood estimation of a unimodal density, II," *Ann. Math. Statist.*, 41, 2169-2174, 1970
- "A note on the estimation of the mode," *Ann. Math. Statist.*, 42, 1909-1915, 1971
- "A cure for 'Instant Insanity'," *Pi Mu Epsilon J.*, 5, 221-223, 1971
- "Nonparametric probability density estimation: I. A summary of available methods," *Technometrics*, 14, 533-546, 1972
- "Nonparametric probability density estimation: II. A comparison of density estimation methods," *J. Statist. Comput. Simul.*, 1, 225-245, 1972
- "Some thoughts on computers and introductory statistics," with Brewster Gere, *Int. J. Math. Educ. Sci. Technol.*, 3, 211-221, 1972
- "On holding a raffle (without making $n-1$ people unhappy)," *Pi Mu Epsilon J.*, 5, 321-325, 1972
- "A note on the existence of perpetual motion machines," *Pi Mu Epsilon J.*, 5, 458-462, 1973
- "Computer graphics in undergraduate statistics," *Int. J. Math. Educ. Sci. Technol.*, 5, 15-23, 1974
- "Some results on nonstationary first order autoregression," *Technometrics*, 16, 321-322, 1974
- Book review of Statistical Inference under Order Restrictions by Barlow et al., *J. Am. Statist. Assoc.*, 69, 290, 1974
- "Sequential nonparametric density estimation," with H. I. Davies, *IEEE Trans. Info. Theory*, IT-21, 619-628, 1975
- "Maximum likelihood estimation of a probability density," *Sankhya(A)*, 37, 211-224, 1975
- Book review of Time Series: Data Analysis and Theory by D. R. Brillinger, *Technometrics*, 18, 121, 1976
- "Toward a theory of probabilistic automata with environments," with J. Gould, *Proceedings of the International Symposium on Information Theory*, Patras, Greece, 837-844, 1976
- "An automaton modeled in an environment," *Proceedings of the First International Conference on Mathematical Modeling*, 1, 501-511, 1977
- "Monte Carlo study of robust estimators of location," with Raymond J. Carroll, *Commun. Statist.-Theory Meth.*, A6(9), 795-812, 1977
- "Did Bacon write Shakespeare's plays," with Anton Glaser, advanced problem 6146 with solution, *Am. Math. Monthly*, 85, 833-834, 1977
- "Likelihood ratio tests for order restrictions in exponential families," with Tim Robertson, *Ann. Statist.*, 6, 485-505, 1978
- "A stochastic model of fertility based on age-parity distribution," with El-Sayed Nour, *Math. Biosciences*, 39, 71-95, 1978

"Remarks on some recursive estimators of a probability density," with H. I. Davies, *Ann. Statist.*, 7, 316-327, 1979

"On probabilistic automata in deterministic environments," with J. Gould, *Ann. Soc. Math. Polonae, Fund. Inform.*, 3, 1-14, 1980

"Isotonic, convex and related splines," with I. W. Wright, *Ann. Statist.*, 8, 1023-1035, 1980

"A time series approach to life table construction," with El-Sayed Nour and Cris Kukuk, *Commun. Statist.-Theory Methods*, A9(15), 1587-1607, 1980

"Two approaches to nonparametric regression: splines and isotonic inference," *Recent Developments in Statistical Inference and Data Analysis*, (K. Matusita, ed.) North Holland: Amsterdam, 323-334, 1980

"Optimal estimation of times series functions," *IEEE Trans. Acoust. Speech Sign. Process.*, ASSP-28, 763-767, 1980

"Vector splines and the estimation of filter functions," *Technometrics*, 23, 83-89, 1981

"Time series analysis with application to remote sensing," *Processes in Marine Remote Sensing*, (F. J. Vernberg and F. P. Diemer, eds.), University of South Carolina Press, 201-215, 1982

"Signal processing methods, sensor signal enhancement and minicomputers," with P. Baylis, A. Deepak, C. R. Francis and E. J. Kibblewhite, *Processes in Marine Remote Sensing*, (F. J. Vernberg and F. P. Diemer, eds.), University of South Carolina Press, 521-525, 1982

"Training statisticians for employment in industry and government," *Teaching of Statistics and Statistical Consulting*, (J. Rustagi and D. Wolfe, eds.), Academic Press: New York, 301-307, 1982

"Density estimation," *Encyclopedia of Statistical Sciences*, (N. Johnson and S. Kotz, eds.), John Wiley and Sons: New York, 309-315, 1982

"Exponential Smoothing," *Encyclopedia of Statistical Sciences*, (N. Johnson and S. Kotz, eds.), John Wiley and Sons: New York, 596-599, 1982

"Automata in random environments with application to machine intelligence," with J. Gould, *IEEE Trans. Pattern Analysis Mach. Intell.*, PAMI-4, 485-492, 1982

"Data fusion," *Statistical Decision Theory and Related Topics III*, Vol 2, (S. Gupta and J. Berger, eds.), Academic Press: New York, 419-433, 1982

"Kalman filters," *Encyclopedia of Statistical Sciences*, (N. Johnson, S. Kotz and C. Read, eds.), John Wiley and Sons: New York, 309-310, 1983

"Kernel estimators," *Encyclopedia of Statistical Sciences*, (N. Johnson, S. Kotz and C. Read, eds.), John Wiley and Sons: New York, 342-346, 1983

"Splines in statistics," with I. W. Wright, *J. Am. Statist. Assoc.*, 78, 351-365, 1983

"Optimal nonparametric function estimation," *J. Statist. Plan. Infer.*, 9, 375-388, 1984

- "Military statistics," with H. Solomon, *Encyclopedia of Statistical Sciences*, (N. Johnson, S. Kotz and C. Read, eds.) John Wiley and Sons: New York, 494-501, 1985
- "New developments and practice for sampling inspection: introductory remarks," with G. C. McDonald, *Navy Research Logist. Q.*, 32, 2-4, 1985
- "Representing multivariate meteorological data using parallel coordinates," *Proceedings of the Tenth Conference on Weather Modification*, 121-123, 1986
- "Midcourse musings," *Bull. Inst. Math. Statist.*, 15, 238-241, 1986
- "Another look at Box-Jenkins forecasting procedures," *Commun. Statist.-Comput. Simul.*, 15(2), 523-530, 1986
- Discussion of "Influence functionals for time series," by R. Douglas Martin and Victor J. Yohai, *Ann. Statist.*, 14, 836-837, 1986
- Discussion of "Computers in Statistical Research," by W. Eddy et al., *Statistical Science*, 1, 449-451, 1986
- "Some personal recollections of Harald Cramer on the development of statistics and probability," *Statistical Science*, 1, 528-535, 1986
- "Computational relevance of the Bayesian paradigm," *Ann. Ops. Research*, 9, 629-633, 1987
- "Vector function estimation using splines," with J. Miller, *J. Statist. Plan. Infer.*, 17, 173-180, 1987
- "A parallel coordinate approach to statistical graphics," *National Computer Graphics Association Conference Proceedings*, 3, 574-580, 1987
- "Commentary on defense funding," *Notices Am. Math. Soc.*, 34(4), 616-618, 1987
- "Invited discussion of 'Graphical perception: the visual decoding of quantitative information on graphical displays of data'," by William S. Cleveland and Robert McGill with Donald T. Gantz, *J. Roy. Statist. Soc. (A)*, 150(3), 192-229, 1987
- Reproducing kernel Hilbert spaces," *Encyclopedia of Statistical Sciences*, (N. Johnson, S. Kotz and C. Read, eds.), 8, 81-84, John Wiley and Sons: New York, 1988
- "Sobolev spaces," *Encyclopedia of Statistical Sciences*, (N. Johnson, S. Kotz and C. Read, eds.), 8, 535-537, John Wiley and Sons: New York, 1988
- "Statistical software," with Annie Hayes, *Encyclopedia of Statistical Sciences*, (N. Johnson, S. Kotz and C. Read, eds.), 8, 667-674, John Wiley and Sons: New York, 1988
- "A view of computational statistics and its curriculum," *Am. Statist. Assoc. Proc. Sect. Statist. Educat.* 1-6, 1988
- Invited discussion: "Application of recent methodology in statistical graphics for nonspecialists," *Am. Statist. Assoc. Proc. Sect. Statist. Graphics*, p. 48, 1988
- "Introduction to assessing uncertainty," with H. Solomon, *J. Statist. Planning Infer.*, 20, 241-244, 1988

- "On randomness, determinism and computability," *J. Statist. Planning Infer.*, 20, 279-294, 1988
- "A graphical tool for distribution and correlation analysis of multiple time series," with C. Shull, *Topics in Non-Gaussian Signal Processing*, (E. Wegman, S. Schwartz and J. Thomas, eds.), Springer-Verlag: New York, 1988.
- "Computational statistics: a new agenda for statistical theory and practice," *J. Washington Acad. Science*, 78, 310-322, 1988.
- "On some graphical representations of multivariate data," with Masood Bolorforoush, *Computing Science and Statistics: Proceedings of the 20th Symposium on the Interface*, 121-126, 1988.
- Invited discussion: "How to get your first research grant," by B. E. Trumbo, *Statistical Science*, 4(2), 146-148, 1989.
- "Parallel coordinate densities," *Proceedings of the 34th Conference on the Design of Experiments in Army Research Development and Testing*, 247-264, 1989.
- "Parallel computing and statistics," *Proceedings of the American Statistical Association Sesquicentennial Invited Paper Sessions*, 231-244, 1989
- "A parallel implementation of data set mapping," with Duane King, *Proceedings of the Fourth Conference on Hypercubes, Concurrent Computers, and Applications*, 1197-1200, 1990
- "Hyperdimensional data analysis using parallel coordinates," *J. American Statist. Assoc.*, 85, 664-675, 1990
- "Nonparametric identification of linear system response," with Hung Tri Le, *Signal Processing*, V, (L. Torres, E. Masgrau, and M. Lagunas, eds.), 229-232, 1990
- "Statistics," *McGraw-Hill Yearbook of Science and Technology: 1991*, 414-416, McGraw-Hill: New York, 1990
- "Generalized function estimation of underwater transient signals," with Hung Tri Le, *J. Acoust. Soc. America*, 89, 274-279, 1991
- "Construction of line densities for parallel coordinate plots," with John J. Miller, *Computing and Graphics in Statistics*, (A. Buja and P. Tukey, eds.), 107-123, Springer-Verlag: New York, 1991; also *Computing Science and Statistics: Proceedings of the 21st Symposium on the Interface*, 191-199, 1990
- "A stochastic approach to load balancing in coarse grain parallel computers," in *Computing and Graphics in Statistics*, (A. Buja and P. Tukey, eds.), 219-230, Springer-Verlag: New York, 1991; also a short version in *Proceedings of the Fourth Conference on Hypercubes, Concurrent Computers, and Applications*, 627-630, 1990
- "Parallelizing multiple linear regression for speed and redundancy: an empirical study," with Mingxian Xu and John J. Miller, *J. Statist. Comput. Simul.*, 39, 205-214, 1991; also *Computing Science and Statistics: Proceedings of the 21st Symposium on the Interface*, 138-144, 1990
- "The grand tour in k-dimensions," *Computing Science and Statistics: Proceedings of the 22nd Symposium on the Interface*, 127-136, 1991

"Adaptive probability density estimation in lower dimensions using random tessellations," with Leonard B. Hearne, *Computing Science and Statistics: Proceedings of the 23rd Symposium on the Interface*, 241-245, 1991

"Introduction to Box and Jenkins (1962) Some statistical aspects of adaptive optimization and control," *Breakthroughs in Statistics, Volume II*, (S. Kotz and N. Johnson, eds.), 361-368, Springer-Verlag: New York, 1992

"Moments and wavelets in signal estimation," with H. T. Le, in *Moments and Signal Processing*, (Purdue, P. and Solomon, H., eds.), Monterey, CA: Naval Postgraduate School, 270-294, 1992

"Stochastic methods for neural systems," with M. K. Habib, *J. Statistical Planning and Inference*, 33, 5-26, 1992

"Maximum entropy density estimation using random tessellations," with L. B. Hearne, *Computing Science and Statistics*, 24, 483-487, 1992

"A spectral representation for the class band-limited functions," with H. T. Le, to appear, *Signal Processing*, 1993

"Visualizing multivariate data," with D. B. Carr and Q. Luo, in *Multivariate Analysis: Future Directions*, (Rao, C. R., ed.), Amsterdam: North Holland, 423-466, 1993

"Statistical graphics and visualization," with D. B. Carr, in *Handbook of Statistics 9: Computational Statistics*, (Rao, C. R., ed.), Amsterdam: North Holland, 857-958, 1993

"Wavelets and nonparametric function estimation," to appear *J. American Statistical Association*, 1993

"Three-dimensional Andrews plots and the grand tour," with J. Shen, to appear, *Computing Science and Statistics*, 1993

TECHNICAL REPORTS

"Some statistical techniques for target detection and discrimination," with M. R. Leadbetter, Technical Report, Department of Statistics, University of North Carolina, Chapel Hill, 1974

"Experimental test of some statistical techniques for active acoustic target detection and classification," with E. G. McLeroy and M. R. Leadbetter, Naval Coastal Systems Laboratory Informal Report NCSL 264-75, 1976

Report on "A Research Study to Determine the Effects of Classroom Openness and the Effects of the Kindergarten Experience on Selected Student Measures," with N. L. Johnson, R. J. Carroll and K. J. C. Smith, presented to the North Carolina Board of Education, 1975

"North Carolina Assessment of Educational Progress of Ninth Grade Students, Spring, 1976: General Description of the Sample," with R. J. Carroll, presented to the North Carolina State Board of Public Instruction, 1976

"The 1976-1977 North Carolina Assessment of Educational Progress of Third Grade Students," with N. L. Johnson, D. Hawkins and R. J. Carroll, presented to the North Carolina State Department of Public Instruction, 1977

"Statistics and Probability Program: Program Summary for Fiscal Year 1981," Office of Naval Research, 1981

"Statistics and Probability Program: Program Summary for Fiscal Year 1982," Office of Naval Research, 1982

"Directory of Naval Mathematicians," with Annie Hayes, Office of Naval Research, 1982

Current and Pending Support

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Edward J. Wegman

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: High Performance Computing Applications to Nonlinear and Transient Signal Processing

Source of Support: ONR

Award Amount (or Annual Rate): \$ 750,000

Period Covered: 3/1/93 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 1.0 FTE Summ:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Virtual Reality for Exploratory Analysis

Source of Support: ONR

Award Amount (or Annual Rate): \$ 80,000

Period Covered: 3/1/92 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 0 Summ: 0

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Visualizing High Dimensional Data

Source of Support: U.S. Army/ ARO

Award Amount (or Annual Rate): \$ 60,000

Period Covered: 3/1/92 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 0 Summ: no effort budgeted

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Computational Algorithms for Generalized NonParametric Function Estimation

Source of Support: National Security Agency

Award Amount (or Annual Rate): \$ 40,560

Period Covered: 6/1/92 - 5/31/94

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: no effort budgeted Summ:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Virtual Environments for Spatial and Volumetric Representation of Information


Source of Support: ONR

Award Amount (or Annual Rate): \$ Requested \$605,412 **Period Covered:** 11/1/93 - 10/31/96

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: .25FTE Summ: 1.5months Year 1
Years 2 & 3 2 months Years 2&3

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

CONTRACT PRICING PROPOSAL COVER SHEET		1. SOLICITATION/CONTRACT/MODIFICATION NO.		FORM APPROVED OMB NO. 9000-13	
NOTE: This Form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6 (b))					
2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code) George Mason University 4400 University Drive Fairfax, VA 22030-4444 DUNS: 07-781-7450 CAGE: 7X764		3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT Jennifer O. Murphy Director, Grants Administration		3B. TELEPHONE NO. (703) 993 - 2988	
		4. TYPE OF CONTRACT ACTION (Check)			
		<input checked="" type="checkbox"/> A. NEW CONTRACT		<input type="checkbox"/> D. LETTER CONTRACT	
		<input type="checkbox"/> B. CHANGE ORDER		<input type="checkbox"/> E. UNPRICED ORDER	
		<input type="checkbox"/> C. PRICE REVISION/REDETERMINATION		<input type="checkbox"/> F. OTHER (Specify)	
5. TYPE OF CONTRACT (Check) <input type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF <input type="checkbox"/> FPI <input checked="" type="checkbox"/> OTHER (Specify) Cost Reimbursement		6. PROPOSED COST (A+B+C)			
		A. COST \$278,998.00		B. PROFIT/FEE \$0	
				C. TOTAL \$278,998.00	
7. PLACE(S) AND PERIOD(S) OF PERFORMANCE George Mason University 1/1/94 - 12/31/96					
8. Listed and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)					
A. LINE ITEM NO.		B. IDENTIFICATION		C. QUANTITY	D. TOTAL PRICE
		Visualization Methods for the Exploration of High Dimensional Data			\$278,998.00
9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)					
A. CONTRACT ADMINISTRATION OFFICE Michael D. Karp ONRRR Georgia Institute of Technology, 206 O'Keefe Bldg. Atlanta, GA 30332-0490			B. AUDIT OFFICE Harvey Cummins, Cost Allocation DHHS, Region III 330 Independence Ave., SW, Cohen Bldg., Room 1067 Washington, DC 20201 (202) 401 - 2774		
10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK (If "Yes," identify)		11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete Item 11B)		11B. TYPE OF FINANCING (Check one)	
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> ADVANCE PAYMENTS <input checked="" type="checkbox"/> PROGRESS PAYMENTS <input type="checkbox"/> GUARANTEED LOANS	
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))		13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)					
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)		B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 OR 2)? (If "Yes," explain in proposal the office to which submitted and if determined to be adequate)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO EXEMPT FAR 30.201 B Subpart 9903.201-1(b)(10)		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)		D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSURE PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
This proposal is submitted in response to the RFP, contract, modification, etc., in item 1 and reflects our best estimates and/or actual costs as of this date and confirms with the instructions in FAR 15.804-6 (b) (2). Table 15-2. By submitting this proposal, the offeror, if selected for negotiation, grants the contracting officer or an authorized representative the right to examine, at any time before award, those books, records, documents and other types of factual information, regardless of form or whether such supporting information is specifically referenced or included in the proposal as the basis for pricing, that will permit an adequate evaluation of the proposed price.					
15. NAME AND TITLE (Type) Jennifer O. Murphy Director, Grants Administration		16. NAME OF FIRM George Mason University			
17. SIGNATURE 				18. DATE OF SUBMISSION	
NSN 7540-01-142-9845		141 - 102		STANDARD FORM 1411 (REV. 7-87)	
Prescribed by GSA FAR (48 CFR) 53.215-2(c)					

SUMMARY PROPOSAL BUDGET

1/1/94 - 12/31/96

Year

OFFEROR George Mason University						FOR ARO USE ONLY						
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward J. Wegman						PROPOSAL NO.		DURATION (MONTHS)				
								Proposed	Granted			
						AWARD NO.						
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						Men Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)	
1. Edward J. Wegman, Ph.D								CAL	ACAD	SUMR	\$70,742	\$
2.												
3.												
4.												
5.												
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)												
7. (1) TOTAL SENIOR PERSONNEL (1-6)									6	70,742		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)												
1. () POST DOCTORAL ASSOCIATES												
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)												
3. (1) GRADUATE STUDENTS										47,288		
4. () UNDERGRADUATE STUDENTS												
5. (1) SECRETARIAL - CLERICAL										31,525		
6. () OTHER												
TOTAL SALARIES AND WAGES (A + B)										149,555		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)										14,332		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)										163,887		
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)												
TOTAL PERMANENT EQUIPMENT										11,357		
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)												
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)										6,000		
2. FOREIGN												
F. PARTICIPANT SUPPORT COSTS												
1. STIPENDS \$												
2. TRAVEL												
3. SUBSISTENCE												
4. OTHER												
() TOTAL PARTICIPANT COSTS												
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)												
1. MATERIALS AND SUPPLIES										2,500		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION												
3. CONSULTANT SERVICES												
4. COMPUTER (ADPE) SERVICES												
5. SUBCONTRACTS												
6. OTHER Tuition										24,963		
TOTAL OTHER DIRECT COSTS										27,463		
H. TOTAL DIRECT COSTS (A THROUGH G)										208,707		
I. INDIRECT COSTS						Overhead	Rate	Base	Total			
47% Salaries & Wages						G & A						
						Fringe						
TOTAL INDIRECT COSTS						FCCM				70,291		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)										278,998		
K. FEE (%) (BASE \$)												
L. COST SHARING												
M. AMOUNT OF THIS REQUEST										278,998		
PI/PD TYPED NAME & SIGNATURE						DATE			FOR ARO USE ONLY			
OFFERORS REP. TYPED NAME & SIGNATURE						DATE						

SUMMARY PROPOSAL BUDGET

Year One

OFFEROR						FOR ARO USE ONLY					
George Mason University						PROPOSAL NO.		DURATION (MONTHS)			
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR								Proposed	Granted		
Edward J. Wegman						AWARD NO.					
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)
1. Edward J. Wegman, Ph.D								CAL	ACAD	SUMR	
2.											
3.											
4.											
5.											
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)											
7. (1) TOTAL SENIOR PERSONNEL (1-6)									2	22,440	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)											
1. () POST DOCTORAL ASSOCIATES											
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)											
3. (1) GRADUATE STUDENTS										15,000	
4. () UNDERGRADUATE STUDENTS											
5. (1) SECRETARIAL - CLERICAL										10,000	
6. () OTHER											
TOTAL SALARIES AND WAGES (A + B)										47,440	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)										4,546	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)										51,986	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)											
TOTAL PERMANENT EQUIPMENT										3,500	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)											
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)										2,000	
2. FOREIGN											
F. PARTICIPANT SUPPORT COSTS											
1. STIPENDS \$											
2. TRAVEL											
3. SUBSISTENCE											
4. OTHER											
() TOTAL PARTICIPANT COSTS											
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)											
1. MATERIALS AND SUPPLIES											
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION										500	
3. CONSULTANT SERVICES											
4. COMPUTER (ADPE) SERVICES											
5. SUBCONTRACTS											
6. OTHER Tuition										7,542	
TOTAL OTHER DIRECT COSTS										8,042	
H. TOTAL DIRECT COSTS (A THROUGH G)										65,528	
I. INDIRECT COSTS						Overhead	Rate	Base	Total		
47% Salaries & Wages						G & A					
						Fringe					
TOTAL INDIRECT COSTS						FCCM				22,297	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)										87,825	
K. FEE (%) (BASE \$)											
L. COST SHARING											
M. AMOUNT OF THIS REQUEST										87,825	
PI/PD TYPED NAME & SIGNATURE						DATE		FOR ARO USE ONLY			
OFFERORS REP. TYPED NAME & SIGNATURE						DATE					

SUMMARY PROPOSAL BUDGET

Year Two

OFFEROR
George Mason University

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Edward J. Wegman

FOR ARO USE ONLY

PROPOSAL NO.	DURATION (MONTHS)	
	Proposed	Granted
AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	Man Hrs/Mos	Rate	Person-mos			Funds Requested By Offeror	Funds Granted By ARO (If Different)
			CAL	ACAD	SUMR		
1. Edward J. Wegman, Ph.D					2	\$23,562	\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)					2	23,562	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (1) GRADUATE STUDENTS						15,750	
4. () UNDERGRADUATE STUDENTS							
5. (1) SECRETARIAL - CLERICAL						10,500	
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						49,812	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						4,773	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						54,585	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)							
TOTAL PERMANENT EQUIPMENT						3,857	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)						2,000	
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$							
2. TRAVEL							
3. SUBSISTENCE							
4. OTHER							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						1,000	
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER Tuition						8,297	
TOTAL OTHER DIRECT COSTS						9,297	
H. TOTAL DIRECT COSTS (A THROUGH G)						69,739	
I. INDIRECT COSTS 47% Salaries & Wages			Overhead		Rate	Base	Total
			G & A				
			Fringe				
			FCCM				
TOTAL INDIRECT COSTS						23,412	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						93,151	
K. FEE (%) (BASE \$)							
L. COST SHARING							
M. AMOUNT OF THIS REQUEST						93,151	
PI/PD TYPED NAME & SIGNATURE						DATE	FOR ARO USE ONLY
OFFERORS REP. TYPED NAME & SIGNATURE						DATE	

SUMMARY PROPOSAL BUDGET

Year Three

OFFEROR
George Mason University

PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR
Edward J. Wegman

FOR ARO USE ONLY		
PROPOSAL NO.	DURATION (MONTHS)	
	Proposed	Granted
AWARD NO.		

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	Men Hrs/Mos	Rate	Person-mos.			Funds Requested By Offeror	Funds Granted By ARO (If Different)
			CAL	ACAD	SUMR		
1. Edward J. Wegman, Ph.D					2	\$24,740	\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)					2	24,740	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (1) GRADUATE STUDENTS						16,537	
4. () UNDERGRADUATE STUDENTS							
5. (1) SECRETARIAL - CLERICAL						11,025	
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						52,302	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						5,012	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						57,314	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)							
TOTAL PERMANENT EQUIPMENT						4,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)							
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						2,000	
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						1,000	
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER Tuition						9,126	
TOTAL OTHER DIRECT COSTS						10,126	
H. TOTAL DIRECT COSTS (A THROUGH G)						73,440	
I. INDIRECT COSTS							
47% Salaries & Wages							
TOTAL INDIRECT COSTS						24,582	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						98,022	
K. FEE (%) (BASE \$)							
L. COST SHARING							
M. AMOUNT OF THIS REQUEST						98,022	
PI/PD TYPED NAME & SIGNATURE				DATE	FOR ARO USE ONLY		
OFFERORS REP. TYPED NAME & SIGNATURE				DATE			

Panel Actions

DEPARTMENT OF THE ARMY
U.S. ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211

PROPOSAL ACTION BRIEF

Proposal No. 32850-MA

Date: 31 May 1994

Title: Visualization Methods for the Exploration of High
Dimensional Data

Subfield: C

Thrust PTS % 100

Institution: George Mason University

Thrust _____ % _____

Principal Investigator (s): Professor Edward J. Wegman

Thrust _____ % _____

Amount/Time Requested: \$278,998/3 yrs

SL: ARL (Bodt)

SC:

RECOMMENDATION:

<u>Accept</u>	<u>16 mos</u>	<u>\$95,000</u>
Action	Duration	Amount

Funding: (Year/Type/Amount)

Fund Category: BH57-05

\$15,000 (Approx) FY94 Math funds (4 mos)

With Incremental Funding as follows:

\$80,000 (approx) FY95 Math funds (12 mos)


With Option to fund:

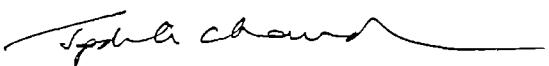
\$80,000 (Approx) FY96 Math funds (12 mos)


\$65,000 (Approx) FY97 Math funds (8 mos)

ACTION:

Approved for 16 months at \$95,000 to be incrementally funded as follows:
first 4 months at approximately \$15,000 FY94 Math funds, following 12 months
at approximately \$80,000 FY95 Math funds with an option to fund following 12
months at approximately \$80,000 FY96 Math and a final 8 months at approximately
\$65,000 FY97 Math funds.


JAGDISH CHANDRA Division Evaluator


JAGDISH CHANDRA Division Director


GEORGE A. NEECE
Director for Research and
Technology Integration

CIVILIAN APPLICABILITY X HIGH, LOW, NO

TECHNICAL OBJECTIVE: Develop immersive exploratory data analytic techniques for high dimensional problems.

TECHNICAL APPROACH: Combine scientific visualization, exploratory data analysis and virtual reality into a new technology for data analysis.

RELEVANCE: Immersive data analytic techniques are needed for interactive visualization of any spatially or volumetrically distributed data with multivariate character. Such data are encountered in surveillance, target acquisition, and mine detection applications.

EVALUATIONS:

Prof. Nozer Singpurwalla (GWU)	A+ /Acc
Prof. David Scott (Rice Univ.)	A- /Acc

ARL (Dr. Bodt)	A/A/Acc/SL
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DIVISION COMMENTS: The PI has an excellent track record of contribution in the area of computational statistics with emphasis on interactive methods for data analysis. This proposal is well thought out and addresses some key emerging technical issues in immersive (virtual reality) technologies. All the reviews are highly laudatory. The PI has interacted very well with various Army groups and the potential for technology transfer is very high. The Division recommends support with funding as follows:

1st increment \$15,000 (approx) FY94 Math funds (4 months)
2nd increment \$80,000 (approx) FY95 Math funds (12 months)

1st option \$80,000 (approx) FY96 Math funds (12 months)
2nd option \$65,000 (approx) FY97 Math funds (8 months)

The proposed research is within the scope of the ARO Broad Agency Announcement (BAA) and the proposal was evaluated using the criteria specified in the ARO BAA.

Based on an evaluation of the proposed research project, it has been determined that the effort does not require the use of a Class I ozone-depleting substance.

Environmental consequences of the research have been assessed. No significant environmental impact is anticipated nor is any environmental controversy expected to be associated with this action. Accordingly, there is no need to prepare a written Environmental Impact Assessment.

SUMMARY PROPOSAL BUDGET

1/1/94 - 12/31/96

Year

FOR ARO USE ONLY		
PROPOSAL NO.	DURATION (MONTHS)	
	Proposed	Granted
AWARD NO.		

OFFEROR George Mason University							
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward J. Wegman							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	Men Hrs/Mos	Rate	Person-mos.			Funds Requested By Offeror	Funds Granted By ARO (If Different)
1. Edward J. Wegman, Ph.D			CAL	ACAD	SUMR	\$70,742	\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)					6	70,742	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (1) GRADUATE STUDENTS						47,288	
4. () UNDERGRADUATE STUDENTS							
5. (1) SECRETARIAL - CLERICAL						31,525	
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						149,555	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						14,332	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						163,887	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)							
TOTAL PERMANENT EQUIPMENT						11,357	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)							
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						6,000	
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$							
2. TRAVEL							
3. SUBSISTENCE							
4. OTHER							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)							
1. MATERIALS AND SUPPLIES						2,500	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER Tuition						24,963	
TOTAL OTHER DIRECT COSTS						27,463	
H. TOTAL DIRECT COSTS (A THROUGH G)						208,707	
I. INDIRECT COSTS			Rate	Base	Total		
47% Salaries & Wages			Overhead				
			G & A				
			Fringe				
TOTAL INDIRECT COSTS			FCCM			70,291	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						278,998	
K. FEE (%) (BASE \$)							
L. COST SHARING							
M. AMOUNT OF THIS REQUEST						278,998	
PI/PD TYPED NAME & SIGNATURE					DATE	FOR ARO USE ONLY 32850-MA Page 3	
OFFERORS REP TYPED NAME & SIGNATURE					DATE		

SUMMARY PROPOSAL BUDGET

Year One

OFFEROR						FOR ARO USE ONLY					
<u>George Mason University</u>						PROPOSAL NO.		DURATION (MONTHS)			
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR						AWARD NO.		Proposed	Granted		
<u>Edward J. Wegman</u>											
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						Men Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)
1. <u>Edward J. Wegman, Ph.D</u>								CAL	ACAD	SUMR	
2.											
3.											
4.											
5.											
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)											
7. (<u>1</u>) TOTAL SENIOR PERSONNEL (1-6)										2	22,440
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)											
1. () POST DOCTORAL ASSOCIATES											
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)											
3. (<u>1</u>) GRADUATE STUDENTS											15,000
4. () UNDERGRADUATE STUDENTS											
5. (<u>1</u>) SECRETARIAL - CLERICAL											10,000
6. () OTHER											
TOTAL SALARIES AND WAGES (A + B)											47,440
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											4,546
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											51,986
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)											
TOTAL PERMANENT EQUIPMENT											3,500
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)											
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)											2,000
2. FOREIGN											
F. PARTICIPANT SUPPORT COSTS											
1. STIPENDS \$ _____											
2. TRAVEL _____											
3. SUBSISTENCE _____											
4. OTHER _____											
() TOTAL PARTICIPANT COSTS											
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)											
1. MATERIALS AND SUPPLIES											
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION											500
3. CONSULTANT SERVICES											
4. COMPUTER (ADPE) SERVICES											
5. SUBCONTRACTS											
6. OTHER <u>Tuition</u>											7,542
TOTAL OTHER DIRECT COSTS											8,042
H. TOTAL DIRECT COSTS (A THROUGH G)											65,528
I. INDIRECT COSTS											
47% Salaries & Wages											
TOTAL INDIRECT COSTS											22,297
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)											87,825
K. FEE (_____ %) (BASE \$ _____)											
L. COST SHARING											
M. AMOUNT OF THIS REQUEST											87,825
PI/PD TYPED NAME & SIGNATURE						DATE		FOR ARO USE ONLY 32850-MA Page 4			
OFFERORS REP. TYPED NAME & SIGNATURE						DATE					

SUMMARY PROPOSAL BUDGET

Year Two

FOR ARO USE ONLY

OFFEROR George Mason University					PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward J. Wegman					AWARD NO.		Proposed	Granted

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	Man Hrs/Mos	Rate	Person-mos.			Funds Requested By Offeror	Funds Granted By ARO (If Different)
			CAL	ACAD	SUMR		
1. Edward J. Wegman, Ph.D					2	\$ 23,562	\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)					2	23,562	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (1) GRADUATE STUDENTS						15,750	
4. () UNDERGRADUATE STUDENTS							
5. (1) SECRETARIAL - CLERICAL						10,500	
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						49,812	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						4,773	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						54,585	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)							
TOTAL PERMANENT EQUIPMENT						3,857	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)						2,000	
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)							
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$							
2. TRAVEL							
3. SUBSISTENCE							
4. OTHER							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						1,000	
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER Tuition						8,297	
TOTAL OTHER DIRECT COSTS						9,297	
H. TOTAL DIRECT COSTS (A THROUGH G)						69,739	
I. INDIRECT COSTS							
47% Salaries & Wages							
TOTAL INDIRECT COSTS						23,412	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						93,151	
K. FEE (%) (BASE \$)							
L. COST SHARING							
M. AMOUNT OF THIS REQUEST						93,151	

PI/PD TYPED NAME & SIGNATURE	DATE	FOR ARO USE ONLY 32850-MA Page 5
OFFERORS REP. TYPED NAME & SIGNATURE	DATE	

SUMMARY PROPOSAL BUDGET

Year Three

OFFEROR George Mason University					FOR ARO USE ONLY						
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward J. Wegman					PROPOSAL NO.		DURATION (MONTHS)				
					AWARD NO.		Proposed	Granted			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)					Man Hrs/Mos	Rate	Person-mos.			Funds Requested By Offeror	Funds Granted By ARO (If Different)
1. Edward J. Wegman, Ph.D							CAL	ACAD	SUMR	\$24,740	\$
2.											
3.											
4.											
5.											
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)											
7. (1) TOTAL SENIOR PERSONNEL (1-6)									2	24,740	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)											
1. () POST DOCTORAL ASSOCIATES											
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)											
3. (1) GRADUATE STUDENTS										16,537	
4. () UNDERGRADUATE STUDENTS											
5. (1) SECRETARIAL - CLERICAL										11,025	
6. () OTHER											
TOTAL SALARIES AND WAGES (A + B)										52,302	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)										5,012	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)										57,314	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)											
TOTAL PERMANENT EQUIPMENT										4,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)											
1. DOMESTIC (INCL CANADA AND U.S. POSSESSIONS)										2,000	
2. FOREIGN											
F. PARTICIPANT SUPPORT COSTS											
1. STIPENDS \$ _____											
2. TRAVEL _____											
3. SUBSISTENCE _____											
4. OTHER _____											
() TOTAL PARTICIPANT COSTS											
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)											
1. MATERIALS AND SUPPLIES											
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION										1,000	
3. CONSULTANT SERVICES											
4. COMPUTER (ADPE) SERVICES											
5. SUBCONTRACTS											
6. OTHER Tuition										9,126	
TOTAL OTHER DIRECT COSTS										10,126	
H. TOTAL DIRECT COSTS (A THROUGH G)										73,440	
I. INDIRECT COSTS											
47% Salaries & Wages					Overhead	Rate	Base	Total			
					G & A						
					Fringe						
					FOCM						
TOTAL INDIRECT COSTS										24,582	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)										98,022	
K. FEE (____%) (BASE \$ _____)											
L. COST SHARING											
M. AMOUNT OF THIS REQUEST										98,022	
PI/PD TYPED NAME & SIGNATURE					DATE		<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> FOR ARO USE ONLY 32850-MA Page 6 </div>				
OFFERORS REP. TYPED NAME & SIGNATURE					DATE						

PRE-AWARD BASIC



DEPARTMENT OF THE ARMY
ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211



REPLY TO
ATTENTION OF

JUL 05 1994

Procurement Office

Subject: Proposal No. P-32850-MA
Grant No. DAAH04-94-G-0267

George Mason University
ATTN: Ms Margaret Hanson
Sponsored Program Administration
Fairfax, Virginia 22030-4444

CONCURRENCE			
BRANCH CHIEF			
CLOSING CLK			
AUTHOR			
TYPIST	NY	BTW	

Dear Ms Hanson:

Enclosed for your retention is a duplicate original of the subject grant agreement. The grants officer has signed the grant which does not require your signature. However, in the event of any disagreement with the grant provisions, you must notify this office within 15 days of the date appearing on Page 3 of the grant document.

Also enclosed is a copy of a letter designating the Contracting Officer's Representative (COR). Please sign the letter and return it to our office.

The Office of Naval Research (ONR) has agreed to serve as Administrative Contracting Officer (ACO) and will perform certain administration duties for this grant. These duties are outlined in Item 13, Delegation of Administrative Functions, Exhibit B, Page 3. Should you have questions concerning the administrative duties to be performed by the ONR ACO, please contact the local ONR representative for assistance. For your convenience my telephone number is (919) 549-4270.

Sincerely,

PSA

Patsy S. Ashe
Grants Officer

Enclosures

Copy Furnished:

ONR

GRANT AWARD CHECK SHEET

Proposal No. 32850-mAGrant No. DAAH04-94-G-0267Modification No. N/AGrantee: George Mason UniversityPerformance Period: 15 July 1994 - 14 November 1995

<u>Tab No.</u>		<u>Initials</u>
<u>1</u>	Legal Review and Approval	<u>pa</u>
<u>2</u>	Grant Pre-Award Evaluation	<u>pa</u>
<u>3</u>	Procurement Request (DA Form 3953) dated <u>2 Jan 1994</u>	<u>pa</u>
<u>4</u>	Budget	<u>pa</u>
<u>5</u>	Other Projects of Principal Investigator and Equipment Determination	<u>pa</u>
<u>6</u>	Pricing Report	<u>pa</u>
<u>7</u>	Appointment of COR	<u>pa</u>
<u>8</u>	Individual Grant Action Report (DD Form 2566)	<u>pa</u>
	Panel Action Brief dated <u>31 May 1994</u> () Attached (X) See Contract File	

AMXRO-PR P-32850-MA

MEMORANDUM FOR AMXRO-LO

SUBJECT: Grant Award Approval for Grant No. DAAH04-94-G-0267

Request legal review and approval of the proposed award.

Encls

Patsy S. Ashe
PATSY S. ASHE
Grants Officer

5 Jul 1994

AMXRO-LO 1st End

FOR AMXRO-PR

The above described proposed grant award is considered legally sufficient and approval of award is recommended.

Encls
nc

Mark H. Rutter
MARK H. RUTTER
Legal Counsel

5 July 1994

AMXRO-PR 2nd End

FOR AMXRO-PR (Patsy Ashe)

The above described proposed grant is approved for award.

Encls
nc

Larry E. Travis
LARRY E. TRAVIS
Chief, Procurement Office

2

GRANT PRE-AWARD EVALUATION

1. GRANTEE: George Mason University
2. PROPOSAL NUMBER: P-32850-MA
3. PROPOSAL ACTION BRIEF DATE: 31 May 1994
4. GRANT NUMBER: DAAH04-94-G-0267
5. DATE OF PROCUREMENT REQUEST: DA Form 3953 dated 2 Jun 1994 (TAB 3)
6. GRANT PERFORMANCE PERIOD: 15 July 1994 - 14 November 1995
7. GRANTEE REPRESENTATIVE:
 - A. NAME: Ms Margaret Hanson
 - B. TELEPHONE NUMBER: (703) 993-2295
8. SUMMARY OF NEGOTIATIONS (SEE EXHIBIT A, PRICING REPORT, FOR DETAILED BREAKDOWN BY COST ELEMENT):

PERIOD	PROPOSED	QUESTIONED	UNRESOLVED	OBJECTIVE	PERIOD
12 months	\$ 87,825	-0-	-0-	\$ 15,000	4 months
12 months	\$ 93,151	-0-	-0-	\$ 80,000	12 months
12 months	\$ 98,022	-0-	-0-	\$ 80,000	12 months
		-0-	-0-	\$ 65,000	8 months
36 months	\$278,998	-0-	-0-	\$240,000	36 months

9. FUNDING PLAN AND EXPLANATION(S) FOR DIFFERENCES (IF ANY) BETWEEN NEGOTIATION OBJECTIVE AND COSTS NEGOTIATED:

		-----NEGOTIATED COSTS-----			
	MONTHS	GRANTOR	GRANTEE	OTHER	TOTAL
FUNDED	4	\$ 15,000	-0-	-0-	\$ 15,000
INCREMENT	12	\$ 80,000	-0-	-0-	\$ 80,000
OPTION	12	\$ 80,000	-0-	-0-	\$ 80,000
OPTION	8	\$ 65,000	-0-	-0-	\$ 65,000
	36	\$240,000	-0-	-0-	\$240,000

The difference between the proposed amount and the negotiated amount results from budget constraints of the Mathematics Division.

A copy of the budget is at TAB 4.

10. FINANCIAL REVIEW:

A review of all financial data has been accomplished. The results are appended as Exhibit A (TAB 6).

11. TECHNICAL REVIEW:

Reference paragraph 6a of ARO Policy Statement 14-92, ARO Cost Control Policy, for definition of the responsibilities of the technical monitor relative to the review of the technical aspects of the proposal budget. A review has been accomplished and is incorporated as part of the pricing results. The pricing report is appended to this documentation as Exhibit A.

12. COMPETITION:

The award is considered competitive as the proposal was submitted in response to the US ARO Broad Agency Announcement dated October 1993.

13. GRANTEE FINANCIAL MANAGEMENT STANDARDS:

The Grantee's financial management system is considered to meet the standards set forth in Attachment F of OMB Circular A-110. The basis for this determination is memo of telephone conversation with ONR-Atlanta.

14. GRANTEE PROPERTY MANAGEMENT STANDARDS:

The Grantee's property management system is considered to meet the standards set forth in Attachment N of OMB Circular A-110. The basis for this determination is memo of telephone conversation with ONR-Atlanta.

15. GRANTEE PROCUREMENT SYSTEM:

The Grantee's procurement system is considered to meet the standards set forth in Attachment O of OMB Circular A-110. The basis for this determination is memo of telephone conversation with ONR-Atlanta.

16. OTHER SPONSORS OF THE SUBJECT PROPOSAL:

The research project is supported entirely by ARO.

17. OTHER PROJECTS OF THE PRINCIPAL INVESTIGATOR/CO-PRINCIPAL INVESTIGATOR:

The grantee has been requested to provide and to certify in writing the following information: (TAB 5)

- a. The names of other possible sponsors to which the proposal is being sent.

- b. A list of active research projects for which the principal investigator is receiving support from outside his organization, to include project title, sponsor (s), direct labor hours of the principal investigator, funds per year and beginning and ending project dates.
- c. A list of proposals submitted to other sponsors and pending acceptance, to include estimated labor effort of the principal investigator, sponsors, project titles, funding per year and beginning and ending project dates.
- d. A list of other teaching, research and administrative duties of the principal investigator, to include percentage of time devoted to each.
- e. A description of any prior Federal employment within one year preceeding the date of proposal submission.

Government agencies may mutually agree to share in the cost of research to be performed by grantees. Participation by grantees in the cost of conducting research projects is also encouraged. Contributions from all sources, however, shall not exceed the total cost that would result had the entire cost of the research been funded by a single source. The ARO technical monitor has reviewed the information submitted by the grantee. Based on this review, ARO support of the subject proposal is not considered to conflict technically or financially, with other research effort of the principal investigator.

18. COMPLIANCE WITH THE CIVIL RIGHTS ACT OF 1964:

The grantee has furnished a certificate signifying compliance with the provisions of P.L. 88-352, 42 U.S.C. 2000 et. seq., the Civil Rights Act of 1964, as implemented in DOD Directive 5500.11.

19. MILITARY RECRUITMENT OF PERSONNEL:

The grantee is not in violation of the statutory limitation contained in Section 606, P. L. 92-436.

20. ENVIRONMENTAL FACTORS:

The environmental factors involved in the research project have been considered pursuant to the guidelines of DOD Directive 6050.1. Evidence of such consideration is contained in the proposal action brief.

21. TECHNICAL REPORTS AND PUBLICATIONS:

Technical reports and publications shall be governed by ARO Form 18, Reporting Instructions, dated 1 February 1994.

22. FINANCIAL REPORTS:

Financial reports shall be submitted as follows:

Report of Federal Cash Transactions (SF 272): Quarterly
Financial Status Report (SF 269): At completion of grant

23. DETERMINATION AND FINDINGS FOR AUTHORITY TO AWARD A GRANT:

See Memorandum dated 26 July 1990, Subject: Blanket Determination to Award Grants. (SLCRO-PR Policy File)

24. PAYMENTS:

Payments shall be as specified in the Grant Schedule.


25. EXEMPT AND NONEXPENDABLE EQUIPMENT PURCHASED WITH GRANT FUNDS:

The grant contains non-expendable equipment in the amount of \$3,000

Title shall vest in the recipient without further obligation or accountability to the grantor.

Property administration is delegated to ONR.

26. SPECIAL CONSIDERATIONS: None



Patsy S. Ashe
GRANT NEGOTIATOR
DATE: 5 Jul 1992

George Mason University

Fairfax, Virginia 22030-4444

(703) 993-1000

TDD: (703) 993-1002

June 27, 1994

Ms. Patsy Ashe
U.S. Army Research Office
AMXRO-PR
Research Triangle Park, NC 27709-2211


RE: Proposal entitled "Visualization methods for the Exploration of High Dimensional Data"
PI: Dr. Edward J. Wegman

Dear Ms. Ashe:

Per your request, enclosed please find completed certifications for the above cited project and a list of current and pending support for Dr. Edward J. Wegman, Principal Investigator for this project. The budgets dated June 3, 1994 are the current approved budgets for this project and enclosed is justification for the equipment costs and other direct costs listed on the budget.

Please contact our office at 703-993-2295 to speak with either Margaret Hanson or me if you need additional information.

Sincerely,


Mindy Barnhart
Grants Administrator
Sponsored Program Administration

Enclosures

Budget Justification for ARO Proposal

This is a justification for the equipment and other expenditures for the proposal to ARO with Dr. Edward J. Wegman as principal investigator.

Technical Equipment: The expense here is modest and is intended to update existing computing equipment. We have in mind memory expansion, video boards, and added hard drive capacity. These equipments are central to the research project.

Travel: Again, the cost is relatively small. The intent is to provide travel funds for professional conferences as well as for attending ARO and Army sponsored activities. We intend, at ARO's request, to work closely with Barry Bodt of ARL so that site visits are appropriate.

Printing and Publications: These funds are intended for production of required technical reports and for the page charges and reprint costs associated with journal publication.

CERTIFICATIONS OF COMPLIANCE AND ACCEPTANCE

The Grantee certifies, by authorized signature hereunder, compliance with and acceptance of:

a. The provisions of P.L. 88-352 (42 U.S.C. 2000 et seq), the Civil Rights Act of 1964, as implemented in DOD Directive 5500.11, Nondiscrimination in Federally Assisted Programs, 27 May 1971.

b. The statutory limitation contained in Section 606, P.L. 92-436, Military Recruitment of Personnel.

c. The provisions of OMB Circular A-110.

d. For grants exceeding \$10,000, compliance with the provisions of Executive Order 11246, as amended: Equal Employment Opportunity.

e. For grants expected to exceed \$100,000 the Grantee certifies that

(1) any facility to be utilized in the performance of this grant is not listed on the Environmental Protection Agency List of Violating Facilities;

(2) he will promptly notify the Grants Officer, prior to award, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency (EPA), indicating that any facility which he proposes to use for the performance under the grant is under consideration to be listed on the EPA List of Violating Facilities; and

(3) he will include substantially this solicitation certification, including this paragraph (e), in every nonexempt subcontract.

f. The provisions of 41 U.S.C. 22, OFFICIALS NOT TO BENEFIT. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this grant, or to any benefit arising from it.

g. The provisions of the Clean Air Act (42 U.S.C. 1857, et seq), Section 114, as amended by P.L. 91-604, and the provisions of the Federal Water Pollution Control Act (33 U.S.C. 1251) as amended by P.L. 92-500.

Organization (Grantee): George Mason University

Signature: 

Typed Name: Jennifer O. Murphy,

Title: Director, Sponsored Program Administration

Date Signed: 6/29/94

CERTIFICATION: DEBARMENT, SUSPENSION, PROPOSED DEBARMENT AND OTHER
RESPONSIBILITY MATTERS--PRIMARY COVERED TRANSACTIONS

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud of a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of the certification, and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

CERTIFIED BY:

J. O. Murphy 6/29/94
(Signature) (Date)

Jennifer O. Murphy

(Typed Name)

George Mason University

(Institution)

QUALIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

A. The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) ~~Submitting a statement~~ notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an on-going drug-free awareness program to inform employees about--

- (1) The dangers of drug abuse in the workplace;
- (2) The grantee's policy of maintaining a drug-free workplace;
- (3) Any available drug counseling, rehabilitation, and employee assistance programs; and
- (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) ~~Submitting the employee to the statement~~ required by paragraph (a) that, as a condition of employment under the grant, the employee will--

- (1) Abide by the terms of the statement; and
- (2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after each conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subdivision (d)(2) from an employee of otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (d)(2), with respect to any employee who is so convicted--

- (1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
- (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

By acceptance of the proposed grant, the grantee acknowledges that the place of performance is as specified in the technical proposal. If there is a difference, the grantee will complete Item B below.

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (street address, city, county, state, zip code)

George Mason University
4400 University Drive
Fairfax, VA 22030

Check ☐ if there are workplaces on file that are not identified here.

John D. Murphy
Grantee's Authorized Representative

6/29/94

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

CERTIFIED BY:

Jennifer O. Murphy 6/29/94
(Signature) (Date)

Jennifer O. Murphy, Director, Sponsored Program Administration

(Typed Name)

George Mason University

(Institution)

Subject: Equipment Acquisition Statement

U.S. Army Research Office
ATTN: DEXRO-PK
P.O. Box 12211
Research Triangle Park, NC 27709

Gentlemen:

This is to inform you that as part of our equipment policy, we are unwilling to contribute to equipment costs under current contracts with ARO and any prospective contracts awarded to us by the ARO.

In the event our policy changes, we will notify you at the time we request specific equipment acquisition approval.

Contractor: George Mason University

Signature: J. O. Murphy

Typed Name: Jennifer O. Murphy

Title: Director, Sponsored Program Administration

Date Signed: 6/29/94

Sponsored Program Administration

George Mason University

Tel# (703) 993-2295

Fax# (703) 993-2296

PR
AsherFACSIMILE
TRANSMISSION COVER SHEET

Transmitted to:

NAME: <i>Patsy Ashe</i>	FAX# <i>919-549-4310</i>
ORGANIZATION:	
BUILDING, ROOM#, ETC.	TELEPHONE/EXT: <i>919-549-4310</i>

Transmitted from:

Mindy Barnhart	
BUILDING, ROOM#, ETC. West Building, Room 145	TELEPHONE/EXT: (703) 993-2297

Transmission Date:	<i>6/29</i>
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PAGES BEING
TRANSMITTED:

<i>10</i>	Include this cover sheet as a page.
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Note: If the receiver did not receive the correct number of pages, please call the transmitter and request retransmission.

CONTENTS/COMMENTS

COMBIE TRANSMITTAL HEADER SHEET

For use of this form, see AF 22-10: The Communications Agency in COMCA

COMMAND OFFICE	NAME/ OFFICE SYMBOL	OFFICE TELEPHONE NO. (AUTOVON/COMM.)	FAX NO. (AUTOVON/COMM.)			
FROM: Director, U.S. Army Research Office Research Triangle Pk, NC 27709-2211	ANDRO- PR	DSN 832-4270 COMM (919) 549-4270	DSN - 832-4310 COMM - (919) 549-4310			
TO: Margaret Hanson	George Mason Univ	(703) 993-2295	(703) 993-2296			
CLASSIFICATION	PRECEDENCE	NO. PAGES (including this Header)	DATE-TIME	MONTH	YEAR	RELEASEE'S SIGNATURE
UNCLASSIFIED	R	6	17	06	94	Patsy Ashe
REMARKS						

Reference: Proposal entitled "Visualization Methods for the Exploration of High Dimensional Data" P.I. Dr. Edward J. Wegman.

Margaret,

Per our telephone conversation of 16 Jun 1994, the reference proposal is proposed to be awarded as follows:

- 4 Months - \$15,000
- 12 months - \$80,000 - increment
- 12 months - \$80,000 - option
- 8 months - \$65,000 - option

Please indicate if your budgets dated 3 June 1994 are current
Provide basis for all equipment costs and "other direct costs"
Proposed start date: 15 July 1994

Complete and return the following certifications:

- Certification Regarding Drug-Free Workplace
- Certification Regarding Debarment . . .
- Certifications of Compliance and Acceptance
- Certification Regarding Lobbying
- Equipment Acquisition Statement

Provide list of Principal Investigator;s other active and pending projects.

Thank you for your assistance.

Patsy Ashe

IF YOU HAVE PROBLEMS IN RECEIVING, PLEASE NOTIFY COMMUNICATIONS CENTER: Comm (919) 549-4298 or DSN 832-4298. EQUIPMENT: HP Laser Jet III.

Space Below For Communications Center Use Only

CALL BACK NUMBER FOR ARO COMM CENTER DSN 832-4298 COMM (919) 549-4298	IF PROBLEMS IN RECEIVING PLEASE NOTIFY COMMUNICATIONS CENTER DSN 832-4298 COMM (919) 549-4298	
---	--	--

CONVERSATION RECORD

TIME

DATE

16 Jun 1992

TYPE

☐ VISIT

☐ CONFERENCE

☐ TELEPHONE

☐ INCOMING

☐ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU

ORGANIZATION (Office, dept., bureau, etc.)

TELEPHONE NO.

Margaret Hanson

St. Mary's Univ

703
993-2295

SUBJECT

ROUTING

NAME/SYMBOL

INT

SUMMARY

gap - 703 - 993 - 2296

Proposed start date - 15 July 1992

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION

SIGNATURE

DATE

ACTION TAKEN

SIGNATURE

TITLE

DATE

George Mason University

Fairfax, Virginia 22030-4444

(703) 993-1000

TDD: (703) 993-1002

June 27, 1994

Ms. Patsy Ashe
U.S. Army Research Office
AMXRO-PR
Research Triangle Park, NC 27709-2211


RE: Proposal entitled "Visualization methods for the Exploration of High Dimensional Data"
PI: Dr. Edward J. Wegman

Dear Ms. Ashe:

Per your request, enclosed please find completed certifications for the above cited project and a list of current and pending support for Dr. Edward J. Wegman, Principal Investigator for this project. The budgets dated June 3, 1994 are the current approved budgets for this project and enclosed is justification for the equipment costs and other direct costs listed on the budget.

Please contact our office at 703-993-2295 to speak with either Margaret Hanson or me if you need additional information.

Sincerely,


Mindy Barnhart
Grants Administrator
Sponsored Program Administration

Enclosures

Budget Justification for ARO Proposal

This is a justification for the equipment and other expenditures for the proposal to ARO with Dr. Edward J. Wegman as principal investigator.

Technical Equipment: The expense here is modest and is intended to update existing computing equipment. We have in mind memory expansion, video boards, and added hard drive capacity. These equipments are central to the research project.

Travel: Again, the cost is relatively small. The intent is to provide travel funds for professional conferences as well as for attending ARO and Army sponsored activities. We intend, at ARO's request, to work closely with Barry Bodt of ARL so that site visits are appropriate.

Printing and Publications: These funds are intended for production of required technical reports and for the page charges and reprint costs associated with journal publication.

Current and Pending Support

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Edward J. Wegman

Support: ☒ Current ☐ Pending ☐ Submission Planned In Near Future ☐ *Transfer of Support

Project/Proposal Title: High Performance Computing Applications to Nonlinear and Transient Signal Processing

Source of Support: ONR

Award Amount (or Annual Rate): \$ 750,000 Period Covered: 3/1/93 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 1.0 FTE Summ:

Support: ☒ Current ☐ Pending ☐ Submission Planned In Near Future ☐ *Transfer of Support

Project/Proposal Title: Virtual Reality for Exploratory Analysis

Source of Support: ONR

Award Amount (or Annual Rate): \$ 80,000 Period Covered: 3/1/92 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 0 Summ: 0

Support: ☒ Current ☐ Pending ☐ Submission Planned In Near Future ☐ *Transfer of Support

Project/Proposal Title: Visualizing High Dimensional Data

Source of Support: U.S. Army/ ARO

Award Amount (or Annual Rate): \$ 60,000 Period Covered: 3/1/92 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 0 Summ: no effort budgeted

Support: ☒ Current ☐ Pending ☐ Submission Planned In Near Future ☐ *Transfer of Support

Project/Proposal Title: Computational Algorithms for Generalized NonParametric Function Estimation

Source of Support: National Security Agency

Award Amount (or Annual Rate): \$ 40,560 Period Covered: 6/1/92 - 5/31/94

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: no effort budgeted Summ:

Support: ☐ Current ☒ Pending ☐ Submission Planned In Near Future ☐ *Transfer of Support

Project/Proposal Title: Virtual Environments for Spatial and Volumetric Representation of Information

Source of Support: ONR

Award Amount (or Annual Rate): \$ Requested \$605,412 Period Covered: 11/1/93 - 10/31/96

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: .25FTE Summ: 1.5months Year 1
Years 2 & 3 2 months Years 2&3

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

APPENDIX VII

Following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Other agencies (including NSF) to which this proposal has been/will be submitted.

Investigator: Edward J. Wegman

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Visualization Methods for Exploration of High Dimensional Data

Source of Support: ARO

Award Amount (or Annual Rate): \$ 278,998

Period Covered: 1/1/94-12/31/96

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: Summ: 2 months

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Computationally Efficient NonParametric Function Estimation

Source of Support: NSF

Award Amount (or Annual Rate): \$ 292,444

Period Covered: 5/1/94 0 4/30/97

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: Summ: 1.5 months

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: DURIP: Instrumentation in Support of Interactive Visualization

Source of Support: Dept. of Defense

Award Amount (or Annual Rate): \$ 206,335

Period Covered: 12/1/94 - 11/30/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: Summ: No effort

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Award Amount (or Annual Rate): \$

Period Covered:

Location of Research:

Person-Months or % of Effort Committed to the Project. Cal: Acad: Summ:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Award Amount (or Annual Rate): \$

Period Covered:

Location of Research:

Person-Months or % of Effort Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT AND OTHER
RESPONSIBILITY MATTERS—PRIMARY COVERED TRANSACTIONS

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud of a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1) (b) of the certification, and

(d) Have not within a three-year period preceding this application/ proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

CERTIFIED BY:

Jen O. Murphy 6/29/94
(Signature) (Date)

Jennifer O. Murphy

(Typed Name)

George Mason University

(Institution)

CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

A. The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispersing, possession or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an on-going drug-free awareness program to inform employees about--

- (1) The dangers of drug abuse in the workplace;
- (2) The grantee's policy of maintaining a drug-free workplace;
- (3) Any available drug counseling, rehabilitation, and employee assistance programs; and
- (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will--

- (1) Abide by the terms of the statement; and
- (2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after each conviction;

(e) Notifying the agency in writing, within ten calendar days after receiving notice under subdivision (d)(2) from an employee of otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted--

- (1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
- (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

By acceptance of the proposed grant, the grantee acknowledges that the place of performance is as specified in the technical proposal. If there is a difference, the grantee will complete Item B below.

B. The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant;

Place of Performance (street address, city, county, state, zip code)

George Mason University

4400 University Drive

Fairfax, VA 22030

Check ☐ if there are workplaces on file that are not identified here.

Jennifer O. Murphy
Grantee's Authorized Representative

Jennifer O. Murphy

6/29/94

CERTIFICATIONS OF COMPLIANCE AND ACCEPTANCE

The Grantee certifies, by authorized signature hereunder, compliance with and acceptance of:

a. The provisions of P.L. 88-352 (42 U.S.C. 2000 et seq), the Civil Rights Act of 1964, as implemented in DOD Directive 5500.11, Nondiscrimination in Federally Assisted Programs, 27 May 1971.

b. The statutory limitation contained in Section 606, P.L. 92-436, Military Recruitment of Personnel.

c. The provisions of OMB Circular A-110.

d. For grants exceeding \$10,000, compliance with the provisions of Executive Order 11246, as amended: Equal Employment Opportunity.

e. For grants expected to exceed \$100,000 the Grantee certifies that

(1) any facility to be utilized in the performance of this grant is not listed on the Environmental Protection Agency List of Violating Facilities;

(2) he will promptly notify the Grants Officer, prior to award, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency (EPA), indicating that any facility which he proposes to use for the performance under the grant is under consideration to be listed on the EPA List of Violating Facilities; and

(3) he will include substantially this solicitation certification, including this paragraph (e), in every nonexempt subcontract.

f. The provisions of 41 U.S.C. 22, OFFICIALS NOT TO BENEFIT. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this grant, or to any benefit arising from it.

g. The provisions of the Clean Air Act (42 U.S.C. 1857, et seq), Section 114, as amended by P.L. 91-604, and the provisions of the Federal Water Pollution Control Act (33 U.S.C. 1251) as amended by P.L. 92-500.

Organization (Grantee): George Mason University

Signature: 

Typed Name: Jennifer O. Murphy,

Title: Director, Sponsored Program Administration

Date Signed: 6/29/94

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

CERTIFIED BY:

Joe Murphy 6/29/94
(Signature) (Date)

Jennifer O. Murphy, Director, Sponsored Program Administration

(Typed Name)

George Mason University

(Institution)

Subject: Equipment Acquisition Statement

U.S. Army Research Office
ATTN: DEXRO-PR
P.O. Box 12211
Research Triangle Park, NC 27709

Gentlemen:

This is to inform you that as part of our equipment policy, we are unwilling to contribute to equipment costs under current contracts with ARO and any prospective contracts awarded to us by the ARO.

In the event our policy changes, we will notify you at the time we request specific equipment acquisition approval.

Contractor: George Mason University

Signature: J. O. Murphy

Typed Name: Jennifer O. Murphy

Title: Director, Sponsored Program Administration

Date Signed: 6/29/94

3

PURCHASE REQUEST AND COMMITMENT For use of this form, see AR 37-1; the proponent agency is OASA(FM)			1 PURCHASE INSTRUMENT NO. <div style="text-align: center;">94-156</div>		2 REQUISITION NO.		3 DATE <div style="text-align: center;">2 June 1994</div>		PAGE OF <div style="text-align: center;">PAGES</div>	
4 TO: Purchasing & Contracting Officer			5 THRU: Resource Management Office			6 FROM: Mathematical & Computer Sciences Div.				
It is requested that the supplies and services enumerated below or on attached list be										
7 PURCHASED FOR Mathematical & Computer Sciences Division						8 DELIVERED TO			9 NOT LATER THAN (Date)	
The supplies and services listed below cannot be secured through normal supply channels or other Army supply sources in the immediate vicinity, and their procurement will not violate existing regulations pertaining to local purchases for stock, therefore, local procurement is necessary for the following reason: (Check appropriate box and complete item.)						10. NAME OF PERSON TO CALL FOR ADDITIONAL INFORMATION			11. TELEPHONE NUMBER	
12. LOCAL PURCHASES AUTHORIZED AS THE NORMAL MEANS OF SUPPLY FOR THE FOREGOING BY				13. REQUISITIONING DISCLOSES NONAVAILABILITY OF ITEMS AND LOCAL PURCHASE IS AUTHORIZED BY		FUND CERTIFICATION The supplies and services listed on this request are properly chargeable to the following allotments, the available balances of which are sufficient to cover the cost thereof, and funds have been committed.				
EMERGENCY SITUATION PRECLUDES USE OF REQUISITION CHANNELS FOR SECURING ITEM										
14. ITEM	15. DESCRIPTION OF SUPPLY OR SERVICES	16. QUANTITY	17. UNIT	18. ESTIMATED		19. ACCOUNTING CLASSIFICATION AND AMOUNT 2142040 46A-7270 P611102.H5705-2583 S31124 \$15,000				
				UNIT PRICE <i>a</i>	TOTAL COST <i>b</i>					
	RESEARCH CONTRACT PROPOSAL NO. 32850-MA (Wegman) George Mason University Request research to be conducted as outlined in the attached approved panel action. Funding to be: \$15,000 FY94 Math funds. R&D Project No. & Title: IL161102 BH57-05 MA	DAAH04-94-G-0267			\$15,000	20. TYPED NAME AND TITLE OF CERTIFYING OFFICER Susan Linens Budget Analyst				
						21. SIGNATURE <i>Susan Linens</i>		22. DATE 6/13/94		
						23. DISCOUNT TERMS				
						24. PURCHASE ORDER NUMBER				
25. THE FOREGOING ITEMS ARE REQUIRED NOT LATER THAN AS INDICATED ABOVE FOR THE FOLLOWING PURPOSE						26. DELIVERY REQUIREMENTS ARE MORE THAN 7 DAYS REQUIRED TO INSPECT AND ACCEPT THE REQUESTED GOODS OR SERVICES YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES, NUMBER OF DAYS REQUIRED				
27. TYPED NAME AND GRADE OF INITIATING OFFICER JAGDISH CHANDRA, SES-4		28. SIGNATURE <i>Jagdish Chandra</i>			29. DATE 2 June 1994		34. TYPED NAME AND GRADE OF APPROVING OFFICER OR DESIGNEE		35. SIGNATURE	
30. TELEPHONE NUMBER (919) 549-4254										
31. TYPED NAME AND GRADE OF SUPPLY OFFICER		32. SIGNATURE			33. DATE					

4



Year 1 FY 94

Page 1-

SUMMARY PROPOSAL BUDGET

Year 2 FY 95

OFFEROR George Mason University						FOR ARO USE ONLY							
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)					
						AWARD NO.		Proposed	Granted				
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)		
1. E. Wegman								CAL	ACAD	SUMR			
2.													
3.													
4.													
5.													
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)													
7. (1) TOTAL SENIOR PERSONNEL (1-6)										2	\$ 24,383	\$	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)													
1. () POST DOCTORAL ASSOCIATES													
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)													
3. (1) GRADUATE STUDENTS											10,000		
4. () UNDERGRADUATE STUDENTS													
5. (1) SECRETARIAL - CLERICAL Grants Administrator											10,000		
6. () OTHER													
TOTAL SALARIES AND WAGES (A + B)											44,383		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											4,465		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											48,848		
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)													
TOTAL PERMANENT EQUIPMENT											1,000		
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)													
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)											1,250		
2. FOREIGN													
F. PARTICIPANT SUPPORT COSTS													
1. STIPENDS \$													
2. TRAVEL													
3. SUBSISTENCE													
4. OTHER													
() TOTAL PARTICIPANT COSTS													
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)													
1. MATERIALS AND SUPPLIES													
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION											500		
3. CONSULTANT SERVICES													
4. COMPUTER (ADPE) SERVICES													
5. SUBCONTRACTS													
6. OTHER Tuition											7,542		
TOTAL OTHER DIRECT COSTS											8,042		
H. TOTAL DIRECT COSTS (A THROUGH G)											59,140		
I. INDIRECT COSTS													
47% of salaries and wages						Overhead	Rate	Base	Total				
						G & A							
						Fringe							
TOTAL INDIRECT COSTS						FCCM					20,860		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)											80,000		
K. FEE () (%) (BASE \$)													
L. COST SHARING													
M. AMOUNT OF THIS REQUEST											80,000		
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/94				FOR ARO USE ONLY			
OFFERORS REP TYPED NAME & SIGNATURE Jennifer O. Murphy						DATE 6/3/94							

SUMMARY PROPOSAL BUDGET

Year 3 FY 96

FOR ARO USE ONLY

OFFEROR George Mason University					PROPOSAL NO.			DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman					AWARD NO.			Proposed	Granted

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)	Man Hrs/Mos	Rate	Person-mos.			Funds Requested By Offeror	Funds Granted By ARO (If Different)
			CAL	ACAD	SUMR		
1. E. Wegman					2	\$ 24,066	\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)					2	24,066	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (1) GRADUATE STUDENTS						10,000	
4. () UNDERGRADUATE STUDENTS							
5. (1) SECRETARIAL-CLERICAL Grant Administrator						10,500	
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						44,566	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						4,574	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						49,140	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)							
TOTAL PERMANENT EQUIPMENT						1,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)							
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						1,000	
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$							
2. TRAVEL							
3. SUBSISTENCE							
4. OTHER							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)							
1. MATERIALS AND SUPPLIES							
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						1,000	
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER Tuition						6,914	
TOTAL OTHER DIRECT COSTS						7,914	
H. TOTAL DIRECT COSTS (A THROUGH G)						59,054	
I. INDIRECT COSTS		Overhead	Rate	Base	Total		
		G & A					
		Fringe					
		FCCM					
TOTAL INDIRECT COSTS						20,946	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						80,000	
K. FEE () (%) (BASE \$)							
L. COST SHARING							
M. AMOUNT OF THIS REQUEST						80,000	

PI/PD TYPED NAME & SIGNATURE Edward J. Wegman	DATE 6/3/96	
OFFEROR'S REP TYPED NAME & SIGNATURE Jennifer O. Murphy, Dir., Sponsored Program Adm.	DATE 6/5/96	

FOR ARO USE ONLY

SUMMARY PROPOSAL BUDGET

Year 4 FY 97

FOR ARO USE ONLY

OFFEROR George Mason University					PROPOSAL NO.		DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman					AWARD NO.		Proposed	Granted

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)	Man Hrs/Mos	Rate	Person-mos.			Funds Requested By Offeror	Funds Granted By ARO (If Different)
			CAL	ACAD	SUMR		
1. E. Wegman					1	\$ 13,441	\$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)							
7. (1) TOTAL SENIOR PERSONNEL (1-6)					1	13,441	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. () POST DOCTORAL ASSOCIATES							
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)							
3. (1) GRADUATE STUDENTS						10,000	
4. () UNDERGRADUATE STUDENTS							
5. (1) SECRETARIAL - CLERICAL Grants Administrator						11,025	
6. () OTHER							
TOTAL SALARIES AND WAGES (A + B)						34,466	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						3,895	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						38,361	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)							
TOTAL PERMANENT EQUIPMENT						1,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)							
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)						1,000	
2. FOREIGN							
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ _____							
2. TRAVEL _____							
3. SUBSISTENCE _____							
4. OTHER _____							
() TOTAL PARTICIPANT COSTS							
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)							
1. MATERIALS AND SUPPLIES						835	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							
3. CONSULTANT SERVICES							
4. COMPUTER (ADPE) SERVICES							
5. SUBCONTRACTS							
6. OTHER Tuition						7,605	
TOTAL OTHER DIRECT COSTS						8,440	
H. TOTAL DIRECT COSTS (A THROUGH G)						48,801	
I. INDIRECT COSTS 47% of salaries and wages			Rate	Base	Total		
		Overhead					
		G & A					
		Fringe					
		FCCM					
TOTAL INDIRECT COSTS						16,199	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						65,000	
K. FEE (_____ %) (BASE \$ _____)							
L. COST SHARING						65,000	
M. AMOUNT OF THIS REQUEST							

PI/PD TYPED NAME & SIGNATURE

Edward J. Wegman

OFFERORS REP TYPED NAME & SIGNATURE

Jennifer O. Murphy

DATE

6/3/94

DATE

6/3/94

FOR ARO USE ONLY

SUMMARY PROPOSAL BUDGET

Year FY 94-FY 97

OFFEROR George Mason University						FOR ARO USE ONLY					
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward J. Wegman						PROPOSAL NO.		DURATION (MONTHS)			
								Proposed	Granted		
						AWARD NO.					
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)
								CAL	ACAD	SUMR	
1. E. Wegman										6	\$ 71,590
2.											
3.											
4.											
5.											
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)											
7. (1) TOTAL SENIOR PERSONNEL (1-6)										6	71,590
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)											
1. () POST DOCTORAL ASSOCIATES											
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)											
3. (1) GRADUATE STUDENTS											30,000
4. () UNDERGRADUATE STUDENTS											
5. (1) SECRETARIAL - CLERICAL Grant Administrator											31,525
6. () OTHER											
TOTAL SALARIES AND WAGES (A + B)											133,115
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											13,675
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											146,790
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)											
TOTAL PERMANENT EQUIPMENT											3,000
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)											
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)											3,250
2. FOREIGN											
F. PARTICIPANT SUPPORT COSTS											
1. STIPENDS \$ _____											
2. TRAVEL _____											
3. SUBSISTENCE _____											
4. OTHER _____											
() TOTAL PARTICIPANT COSTS											
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)											
1. MATERIALS AND SUPPLIES											2,335
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION											
3. CONSULTANT SERVICES											
4. COMPUTER (ADPE) SERVICES											
5. SUBCONTRACTS											
6. OTHER Tuition											22,060
TOTAL OTHER DIRECT COSTS											24,395
H. TOTAL DIRECT COSTS (A THROUGH G)											177,436
I. INDIRECT COSTS											
47% of salaries and wages											
						Overhead	Rate	Base	Total		
						G & A					
						Fringe					
						FCCM					
TOTAL INDIRECT COSTS											62,564
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)											240,000
K. FEE (_____ %) (BASE \$ _____)											
L. COST SHARING											
M. AMOUNT OF THIS REQUEST											240,000

PI/PD TYPED NAME & SIGNATURE

Edward J. Wegman

OFFERORS REP TYPED NAME & SIGNATURE

Jennifer O. Murphy

DATE

6/3/94

DATE

6/3/94

FOR ARO USE ONLY

CONTRACT PRICING PROPOSAL COVER SHEET		1. SOLICITATION/CONTRACT/MODIFICATION NO.		FORM APPROVED OMB NO. 9000-13	
NOTE: This Form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6 (b))					
2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)		3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT		3B. TELEPHONE NO.	
George Mason University 4400 University Drive Fairfax, VA 22030-4444 DUNS: 07-781-7450 CAGE: 7X764		Jennifer O. Murphy Director, Sponsored Program Admin.		(703) 993 - 2988	
5. TYPE OF CONTRACT (Check)		4. TYPE OF CONTRACT ACTION (Check)			
<input type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAP <input type="checkbox"/> FPI <input checked="" type="checkbox"/> OTHER (Specify) Cost Reimbursement		<input checked="" type="checkbox"/> A. NEW CONTRACT <input type="checkbox"/> D. LETTER CONTRACT <input type="checkbox"/> B. CHANGE ORDER <input type="checkbox"/> E. UNPRICED ORDER <input type="checkbox"/> C. PRICE REVISION/REDETERMINATION <input type="checkbox"/> F. OTHER (Specify)			
7. PLACE(S) AND PERIOD(S) OF PERFORMANCE		6. PROPOSED COST (A+B+C)			
George Mason University 7/1/94 - 6/30/97		A. COST \$240,000.00 B. PROFIT/FEE \$0 C. TOTAL \$240,000.00			
8. Listed and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)					
A. LINE ITEM NO.		B. IDENTIFICATION		C. QUANTITY	D. TOTAL PRICE
		Visualization Methods for the Exploration of High Dimensional Data			\$240,000.00
9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)					
A. CONTRACT ADMINISTRATION OFFICE			B. AUDIT OFFICE		
Mr. Michael Karp ONRRR Georgia Institute of Tech., 206 O'Keefe Bldg. Atlanta, GA 30332-0490 404-347-4374			Harvey Cummins, Cost Allocation DHHS, Region III 330 Independence Ave., SW, Cohen Bldg., Room 1067 Washington, DC 20201 (202) 401 - 2774		
10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK (If "Yes," identify)		11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete Item 11B)		11B. TYPE OF FINANCING (Check one)	
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> ADVANCE PAYMENTS <input checked="" type="checkbox"/> PROGRESS PAYMENTS <input type="checkbox"/> GUARANTEED LOANS	
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))		13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)					
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)		B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 OR 2)? (If "Yes," explain in proposal the office to which submitted and if determined to be adequate)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO EXEMPT FAR 30.201 B Subpart 9903.201-1(b)(10)		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)		D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSURE PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
This proposal is submitted in response to the RFP, contract, modification, etc., in item 1 and reflects our best estimates and/or actual costs as of this date and confirms with the instructions in FAR 15.804-6 (b) (2). Table 15-2. By submitting this proposal, the offeror, if selected for negotiation, grants the contracting officer or an authorized representative the right to examine, at any time before award, those books, records, documents and other types of factual information, regardless of form or whether such supporting information is specifically referenced or included in the proposal as the basis for pricing, that will permit an adequate evaluation of the proposed price.					
15. NAME AND TITLE (Type)		16. NAME OF FIRM			
Jennifer O. Murphy Director, Sponsored Program Administration		George Mason University			
17. SIGNATURE		18. DATE OF SUBMISSION			
		6/3/94			
NSN 7540-01-142-9845 1411 - 102 STANDARD FORM 1411 (REV. 7-87) Prescribed by GSA FAR (48 CFR) 53.215-2(c)					

5

AMXRO -PR

MEMORANDUM FOR AMXRO- MA

SUBJECT: Grant No. DAA H04-94-G-0267 with George Mason University

1. The Procurement Office is currently negotiating a grant with the subject organization. To assist us, please provide your recommendation with respect to:

(X) Other research projects of the principal investigator(a) (paragraph 2 below).

(X) Purchase of equipment and transfer of title (paragraph 3, below).

2. Other Research Projects of the PI/Co-PI:

In the attached letter (Enclosure 1) the grantee has provided a listing of other active research projects of the principal investigator(s). Please indicate below whether the subject project conflicts technically or financially with these other research projects.


3. Purchase of Equipment and Transfer of Title:

Funds in the amount of \$ 3,000 are budgeted for the purchase of non-expendable equipment (see attached budget). The equipment is categorized as follows:

a. Items with a unit cost of less than \$5,000 \$ _____

b. Items with a unit cost in excess of \$5,000 \$ _____

It is the general policy of the DoD to vest title of equipment to the grantee when (i) the purchase of equipment is essential for performance of the grant (ii) the grantee complies with the grant provisions and (iii) the vesting of title is in the best interest of the Government. However, prior to providing funds to a grantee for the purchase of any item of equipment, the grant officer must make a determination that the purchase of such equipment is essential for performance of the grant and is in the best interest of the Government. Accordingly, we request your recommendations concerning (i) the purchase and (ii) the vesting of title of the items of equipment identified in the budget. Based upon your affirmative recommendation to purchase, title to all items with a unit cost of less than \$5,000 shall vest with the grantee upon acquisition of the equipment and title to items costing in excess of \$5,000 shall each be determined by the grant officer in accordance with your recommendation. The Scientific Advisor and the Chief of the Procurement Office are required to sign the memo in Comment 2 when (i) the unit acquisition cost of any item exceeds \$10,000 and (ii) the title to any item of equipment having a unit acquisition cost in excess of \$10,000 is retained by the Government.


PATSY S. ASHE
Grant Officer

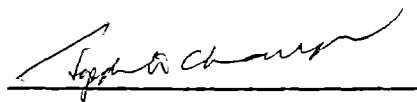
AMXRO-PR 1st End

SUBJECT: Grant No. DAA H04-94-G-0267 with George Mason University

FOR AMXRO-PR

1. The subject grant () does (✓) does not conflict technically or financially with the PI/Co-PI's other research projects.

2. The equipment identified in the grantee's attached budget () is () is not essential to performance of the grant and purchase of such equipment (✓) is () is not recommended. For those items having a unit acquisition cost in excess of \$5,000, title should (✓) vest with the grantee () vest with the grantee with ARO retaining the rights to transfer title to the Government or an eligible third party named by the Government () vest with the Government.



Technical Monitor

Date:

Concur with Disposition of Equipment:

() GEORGE A. NEECE
Scientific Advisor
Date:

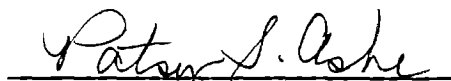
() JACK L. HARLESS
Chief, Procurement Office
Date:

MFR

Based upon the above information and recommendations, the equipment to be purchased with funds of this grant:

(✓) is essential for performance of the grant and (✓) shall vest with the grantee.

() shall vest with the grantee with ARO retaining the right to transfer title to the Government or an eligible third party named by the Government
() vest with the Government.



PATSY S. ASHE
Grant Officer
Date:

Current and Pending Support

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Edward J. Wegman

Port: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: High performance Computing Applications to Nonlinear and Transient Signal Processing

Source of Support: ONR

Award Amount (or Annual Rate): \$ 750,000 Period Covered: 3/1/93 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 1.0 FTE Summ:

Port: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Virtual Reality for Exploratory Analysis

Source of Support: ONR

Award Amount (or Annual Rate): \$ 80,000 Period Covered: 3/1/92 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 0 Summ: 0

Port: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Visualizing High Dimensional Data

Source of Support: U.S. Army/ ARO

Award Amount (or Annual Rate): \$ 60,000 Period Covered: 3/1/92 - 2/28/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: 0 Summ: no effort budgeted

Port: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Computational Algorithms for Generalized NonParametric Function Estimation

Source of Support: National Security Agency

Award Amount (or Annual Rate): \$ 40,560 Period Covered: 6/1/92 - 5/31/94

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: no effort budgeted Summ:

Port: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Virtual Environments for Spatial and Volumetric Representation of Information

Source of Support: ONR

Award Amount (or Annual Rate): \$ Requested \$605,412 Period Covered: 11/1/93 - 10/31/96

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project. Cal: Acad: .25FTE Summ: 1.5 months Year 1
Years 2 & 3 2 months Years 2 & 3

If project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

Following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Other agencies (including NSF) to which this proposal has been/will be submitted.

Investigator: Edward J. Wegman

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Visualization Methods for Exploration of High Dimensional Data

Source of Support: ARO

Award Amount (or Annual Rate): \$ 278,998

Period Covered: 1/1/94-12/31/96

Location of Research:

Person-Months or % of Effort Committed to the Project. George Mason University

Cal:

Acad:

Summ: 2 months

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Computationally Efficient NonParametric Function Estimation

Source of Support:

NSF

Award Amount (or Annual Rate): \$ 292,444

Period Covered: 5/1/94 to 4/30/97

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project.

Cal:

Acad:

Summ: 1.5 months

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: DURIP: Instrumentation in Support of Interactive Visualization

Source of Support: Dept. of Defense

Award Amount (or Annual Rate): \$ 206,335

Period Covered: 12/1/94 - 11/30/95

Location of Research: George Mason University

Person-Months or % of Effort Committed to the Project.

Cal:

Acad:

Summ: No effort

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Award Amount (or Annual Rate): \$

Period Covered:

Location of Research:

Person-Months or % of Effort Committed to the Project.

Cal:

Acad:

Summ:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Award Amount (or Annual Rate): \$

Period Covered:

Location of Research:

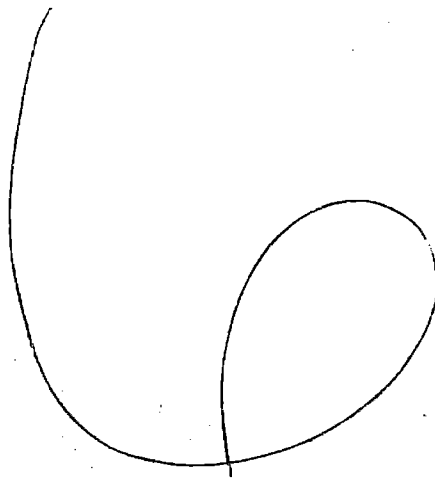
Person-Months or % of Effort Committed to the Project.

Cal:

Acad:

Summ:

If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.



SUBJECT: REPORT ON REVIEW OF PROPOSED COST
PROPOSAL NUMBER: 32850-MA
GRANTEE: GEORGE MASON UNIVERSITY (GMU)
TOTAL COST PROPOSED: \$240,000
TYPE OF AGREEMENT PROPOSED: COST, WITHOUT FEE

1. PURPOSE. A pricing review of proposed costs has been completed. A summary of the review is shown below. Other comments that are pertinent to the award are set forth in paragraph 5.

2. REFERENCES:

a. Grantee's Proposal including the budget (See Attachment 1)

- (1) Original Proposal Dated: 12 NOV 94
- (2) Revised Budget: 6-3-94

b. ARO Technical Monitor Review of Technical Aspects of Cost Proposal (See Attachment 2)

3. SUMMARY RESULTS OF REVIEW: The summary results of review as pertains to the offeror's most recent budget submission referenced in paragraph 2a are set forth below:

	COST SHARING	PROPOSED	QUESTIONED	OBJECTIVE
PERIOD 1	\$ 0	\$ 15,000	\$ 0	\$ 15,000
PERIOD 2	0	80,000	0	80,000
PERIOD 3	0	80,000	0	80,000
PERIOD 4	0	65,000	0	65,000
TOTAL	\$ 0	\$240,000	\$ 0	\$240,000

4. This is a new grant award. Funding will be as follows:

a. Current Funding:

Number of Months: 4
Amount: \$15,000

b. Prospective Increments:

Number of Months: 12
Amount: \$80,000

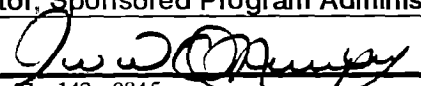
c. Prospective Options:

Number of Months: 20
Amount: \$145,000

5. OTHER COMMENTS: This GMU application will be negotiated for an initial 16 months with full funding for the first 4 months and incremental funding for the remaining and option provisions for an additional 20 months (4, 12, 12, 8).

Carl Meschter
CARL MESCHTER
COST/PRICE ANALYST

30 JUN 94

CONTRACT PRICING PROPOSAL COVER SHEET		1. SOLICITATION/CONTRACT/MODIFICATION NO.		FORM APPROVED OMB NO. 9000-13	
NOTE: This Form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6 (b))					
2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code) George Mason University 4400 University Drive Fairfax, VA 22030-4444 DUNS: 07-781-7450 CAGE: 7X764		3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT Jennifer O. Murphy Director, Sponsored Program Admin.		3B. TELEPHONE NO: (703) 993 - 2988	
		4. TYPE OF CONTRACT ACTION (Check)			
		<input checked="" type="checkbox"/> A. NEW CONTRACT		<input type="checkbox"/> D. LETTER CONTRACT	
		<input type="checkbox"/> B. CHANGE ORDER		<input type="checkbox"/> E. UNPRICED ORDER	
		<input type="checkbox"/> C. PRICE REVISION/REDETERMINATION		<input type="checkbox"/> F. OTHER (Specify)	
5. TYPE OF CONTRACT (Check)		6. PROPOSED COST (A+B+C)			
<input type="checkbox"/> FFP <input type="checkbox"/> CPFF <input type="checkbox"/> CPIF <input type="checkbox"/> CPAF <input type="checkbox"/> FPI <input checked="" type="checkbox"/> OTHER (Specify) Cost Reimbursement		A. COST \$240,000.00		B. PROFIT/FEE \$0	
				C. TOTAL \$240,000.00	
7. PLACE(S) AND PERIOD(S) OF PERFORMANCE George Mason University 7/1/94 - 6/30/97					
8. Listed and reference the identification, quantity and total price proposed for each contract line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)					
A. LINE ITEM NO.		B. IDENTIFICATION		C. QUANTITY	D. TOTAL PRICE
		Visualization Methods for the Exploration of High Dimensional Data			\$240,000.00
9. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)					
A. CONTRACT ADMINISTRATION OFFICE Mr. Michael Karp ONRRR Georgia Institute of Tech., 206 O'Keefe Bldg. Atlanta, GA 30332-0490 404-347-4374			B. AUDIT OFFICE Harvey Cummins, Cost Allocation DHHS, Region III 330 Independence Ave., SW, Cohen Bldg., Room 1067 Washington, DC 20201 (202) 401 - 2774		
10. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK (If "Yes," identify)		11A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete Item 11B)		11B. TYPE OF FINANCING (Check one)	
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> ADVANCE PAYMENTS <input checked="" type="checkbox"/> PROGRESS PAYMENTS <input type="checkbox"/> GUARANTEED LOANS	
12. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s) and contract number(s))		13. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
14. COST ACCOUNTING STANDARDS BOARD (CASB) DATA (Public Law 91-379 as amended and FAR PART 30)					
A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)		B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 OR 2)? (If "Yes," explain in proposal the office to which submitted and if determined to be adequate)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO EXEMPT FAR 30.201 B Subpart 9903.201-1(b)(10)		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)		D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSURE PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
This proposal is submitted in response to the RFP, contract, modification, etc., in item 1 and reflects our best estimates and/or actual costs as of this date and confirms with the instructions in FAR 15.804-6 (b) (2). Table 15-2. By submitting this proposal, the offeror, if selected for negotiation, grants the contracting officer or an authorized representative the right to examine, at any time before award, those books, records, documents and other types of factual information, regardless of form or whether such supporting information is specifically referenced or included in the proposal as the basis for pricing, that will permit an adequate evaluation of the proposed price.					
15. NAME AND TITLE (Type) Jennifer O. Murphy Director, Sponsored Program Administration		16. NAME OF FIRM George Mason University			
17. SIGNATURE 				18. DATE OF SUBMISSION 6/3/94	
NSN 7540-01-142-9845		1411 - 102		STANDARD FORM 1411 (REV. 7-87)	
Prescribed by GSA FAR (48 CFR) 53.215-2 (c)					

ATT

SUMMARY PROPOSAL BUDGET

Year FY 94-FY 97

OFFEROR George Mason University						FOR ARO USE ONLY						
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward J. Wegman						PROPOSAL NO.		DURATION (MONTHS)				
						Proposed		Granted				
AWARD NO.												
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)	
								CAL	ACAD	SUMR		
1. E. Wegman										6	\$ 71,590	\$
2.												
3.												
4.												
5.												
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)												
7. (1) TOTAL SENIOR PERSONNEL (1-6)										6	71,590	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)												
1. () POST DOCTORAL ASSOCIATES												
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)												
3. (1) GRADUATE STUDENTS											30,000	
4. () UNDERGRADUATE STUDENTS												
5. (1) SECRETARIAL - CLERICAL Grant Administrator											31,525	
6. () OTHER												
TOTAL SALARIES AND WAGES (A + B)											133,115	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											13,675	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											146,790	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)												
TOTAL PERMANENT EQUIPMENT											3,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)												
1. DOMESTIC (INCL CANADA AND U.S. POSSESSIONS)											3,250	
2. FOREIGN												
F. PARTICIPANT SUPPORT COSTS												
1. STIPENDS \$ _____												
2. TRAVEL _____												
3. SUBSISTENCE _____												
4. OTHER _____												
() TOTAL PARTICIPANT COSTS												
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)												
1. MATERIALS AND SUPPLIES												
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION											2,335	
3. CONSULTANT SERVICES												
4. COMPUTER (ADPE) SERVICES												
5. SUBCONTRACTS												
6. OTHER Tuition											22,060	
TOTAL OTHER DIRECT COSTS											24,395	
H. TOTAL DIRECT COSTS (A THROUGH G)											177,436	
I. INDIRECT COSTS												
47% of salaries and wages						Overhead	Rate	Base	Total			
						G & A						
						Fringe						
						FCCM					62,564	
TOTAL INDIRECT COSTS											240,000	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)												
K. FEE (____ %) (BASE \$ _____)												
L. COST SHARING												
M. AMOUNT OF THIS REQUEST											240,000	
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/94		FOR ARO USE ONLY				
OFFERORS REP TYPED NAME & SIGNATURE Jennifer O. Murphy						DATE 6/3/94						

SUMMARY PROPOSAL BUDGET

Year 1 FY 94

OFFEROR George Mason University						FOR ARO USE ONLY					
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)			
						AWARD NO.		Proposed	Granted		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (if Different)
								CAL	ACAD	SUMR	
1. E. Wegman										1	\$ 9,700
2.											
3.											
4.											
5.											
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)											
7. (1) TOTAL SENIOR PERSONNEL (1-6)										1	9,700
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)											
1. () POST DOCTORAL ASSOCIATES											
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)											
3. () GRADUATE STUDENTS											
4. () UNDERGRADUATE STUDENTS											
5. () SECRETARIAL - CLERICAL											
6. () OTHER											
TOTAL SALARIES AND WAGES (A + B)										9,700	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)										741	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)										10,441	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)											
TOTAL PERMANENT EQUIPMENT											
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)											
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)											
2. FOREIGN											
F. PARTICIPANT SUPPORT COSTS											
1. STIPENDS \$ _____											
2. TRAVEL _____											
3. SUBSISTENCE _____											
4. OTHER _____											
() TOTAL PARTICIPANT COSTS											
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)											
1. MATERIALS AND SUPPLIES											
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION											
3. CONSULTANT SERVICES											
4. COMPUTER (ADPE) SERVICES											
5. SUBCONTRACTS											
6. OTHER											
TOTAL OTHER DIRECT COSTS											
H. TOTAL DIRECT COSTS (A THROUGH G)										10,441	
I. INDIRECT COSTS											
47% of salaries and wages						Overhead	Rate	Base	Total		
						G & A					
						Fringe					
TOTAL INDIRECT COSTS						FCCM				4,559	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)										15,000	
K. FEE () (%) (BASE \$)											
L. COST SHARING											
M. AMOUNT OF THIS REQUEST										15,000	
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/94		FOR ARO USE ONLY			
OFFERORS REP TYPED NAME & SIGNATURE Jennifer O. Murphy						DATE 6/3/94					

SUMMARY PROPOSAL BUDGET

Year 2 FY 95

OFFEROR George Mason University						FOR ARO USE ONLY					
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)			
								Proposed	Granted		
						AWARD NO.					
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)						Men Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)
						CAL	ACAD	SUMR			
1. E. Wegman								2	\$ 24,383	\$	
2.											
3.											
4.											
5.											
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)											
7. (1) TOTAL SENIOR PERSONNEL (1-6)								2	24,383		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)											
1. () POST DOCTORAL ASSOCIATES											
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)											
3. (1) GRADUATE STUDENTS									10,000		
4. () UNDERGRADUATE STUDENTS											
5. (1) SECRETARIAL - CLERICAL Grants Administrator									10,000		
6. () OTHER											
TOTAL SALARIES AND WAGES (A + B)									44,383		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)									4,465		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)									48,848		
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)											
TOTAL PERMANENT EQUIPMENT									1,000		
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)											
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)									1,250		
2. FOREIGN											
F. PARTICIPANT SUPPORT COSTS											
1. STIPENDS \$											
2. TRAVEL											
3. SUBSISTENCE											
4. OTHER											
() TOTAL PARTICIPANT COSTS											
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)											
1. MATERIALS AND SUPPLIES											
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION									500		
3. CONSULTANT SERVICES											
4. COMPUTER (ADPE) SERVICES											
5. SUBCONTRACTS											
6. OTHER Tuition									7,542		
TOTAL OTHER DIRECT COSTS									8,042		
H. TOTAL DIRECT COSTS (A THROUGH G)									59,140		
I. INDIRECT COSTS											
47% of salaries and wages						Overhead	Rate	Base	Total		
						G & A					
						Fringe					
						FCCM					
TOTAL INDIRECT COSTS									20,860		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)									80,000		
K. FEE () (%) (BASE \$)											
L. COST SHARING											
M. AMOUNT OF THIS REQUEST									80,000		

PI/PD TYPED NAME & SIGNATURE

Edward J. Wegman

OFFERORS REP TYPED NAME & SIGNATURE

Jennifer O. Murphy

DATE

6/3/94

DATE

6/3/94

FOR ARO USE ONLY

SUMMARY PROPOSAL BUDGET

Year 3 FY 96

OFFEROR George Mason University						FOR ARO USE ONLY			
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)	
						Proposed		Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						AWARD NO.			
	Man Hrs/Mos	Rate	Person-mos.			Funds Requested By Offeror	Funds Granted By ARO (If Different)		
			CAL	ACAD	SUMR				
1. E. Wegman					2	\$ 24,066	\$		
2.									
3.									
4.									
5.									
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)									
7. (1) TOTAL SENIOR PERSONNEL (1-6)					2	24,066			
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)									
1. () POST DOCTORAL ASSOCIATES									
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)									
3. (1) GRADUATE STUDENTS						10,000			
4. () UNDERGRADUATE STUDENTS									
5. (1) SECRETARIAL - CLERICAL Grant Administrator						10,500			
6. () OTHER									
TOTAL SALARIES AND WAGES (A + B)						44,566			
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						4,574			
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						49,140			
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)									
TOTAL PERMANENT EQUIPMENT						1,000			
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)									
1. DOMESTIC (INCL CANADA AND U.S. POSSESSIONS)						1,000			
2. FOREIGN									
F. PARTICIPANT SUPPORT COSTS									
1. STIPENDS \$									
2. TRAVEL									
3. SUBSISTENCE									
4. OTHER									
() TOTAL PARTICIPANT COSTS									
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)									
1. MATERIALS AND SUPPLIES									
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						1,000			
3. CONSULTANT SERVICES									
4. COMPUTER (ADPE) SERVICES									
5. SUBCONTRACTS									
6. OTHER Tuition						6,914			
TOTAL OTHER DIRECT COSTS						7,914			
H. TOTAL DIRECT COSTS (A THROUGH G)						59,054			
I. INDIRECT COSTS									
	Overhead	Rate	Base	Total					
	G & A								
	Fringe								
	FCCM								
TOTAL INDIRECT COSTS						20,946			
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						80,000			
K. FEE (%) (BASE \$)									
L. COST SHARING									
M. AMOUNT OF THIS REQUEST						80,000			

PI/PD TYPED NAME & SIGNATURE
Edward J. Wegman

OFFERORS REP. TYPED NAME & SIGNATURE
Jennifer O. Murphy, Dir., Sponsored Program Adm.

DATE
6/3/96

DATE
6/5/96

FOR ARO USE ONLY

SUMMARY PROPOSAL BUDGET

Year 4 FY 97

OFFEROR George Mason University						FOR ARO USE ONLY						
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)				
						Proposed		Granted				
AWARD NO.												
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)	
1. E. Wegman								CAL	ACAD	SUMR	\$ 13,441	\$
2.												
3.												
4.												
5.												
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)												
7. (1) TOTAL SENIOR PERSONNEL (1-6)									1	13,441		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)												
1. () POST DOCTORAL ASSOCIATES												
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)												
3. (1) GRADUATE STUDENTS										10,000		
4. () UNDERGRADUATE STUDENTS												
5. (1) SECRETARIAL - CLERICAL Grants Administrator										11,025		
6. () OTHER												
TOTAL SALARIES AND WAGES (A + B)										34,466		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)										3,895		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)										38,361		
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)												
TOTAL PERMANENT EQUIPMENT										1,000		
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)												
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)										1,000		
2. FOREIGN												
F. PARTICIPANT SUPPORT COSTS												
1. STIPENDS \$												
2. TRAVEL												
3. SUBSISTENCE												
4. OTHER												
() TOTAL PARTICIPANT COSTS												
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)												
1. MATERIALS AND SUPPLIES												
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION										835		
3. CONSULTANT SERVICES												
4. COMPUTER (ADPE) SERVICES												
5. SUBCONTRACTS												
6. OTHER Tuition										7,605		
TOTAL OTHER DIRECT COSTS										8,440		
H. TOTAL DIRECT COSTS (A THROUGH G)										48,801		
I. INDIRECT COSTS												
47% of salaries and wages						Overhead	Rate	Base	Total			
						G & A						
						Fringe						
						FCCM						
TOTAL INDIRECT COSTS										16,199		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)										65,000		
K. FEE () (%) (BASE \$)												
L. COST SHARING										65,000		
M. AMOUNT OF THIS REQUEST												

PI/PD TYPED NAME & SIGNATURE

Edward J. Wegman

OFFERORS REP TYPED NAME & SIGNATURE

Jennifer O. Murphy

DATE

6/3/94

DATE

6/3/94

FOR ARO USE ONLY

NOTES TO ATTACHMENT 1
OFFEROR'S BUDGET

DIRECT LABOR:

HOURS. The offeror's proposal was predicated upon engineering estimates prepared by the principal investigator. There is no historical cost information available for comparison purposes. The estimated hours were reviewed by the ARO technical monitor (see Attachment 2) and determined reasonable.

RATES. GMU's proposed rates represent actual rates of pay for the employees proposed for use under the research agreement. The rates for the principal investigator and other primary researchers to be assigned to the project were converted to an annual salary rate. The annualized rate was submitted to the ARO technical monitor for his recommendation on the propriety of the rates. The rates proposed were determined reasonable based upon this review (see Attachment 2).

INDIRECT COST RATES. The prospective indirect rates are IAW the most recently established rates per DHHS agreement.

DOMESTIC TRAVEL COST. The need for the trips proposed was reviewed by the ARO technical monitor and deemed required (see Attachment 2). The proposed costs are IAW the current ARO cost control policy limits pertaining to domestic travel of the principal investigator. The proposed travel is considered to be a reasonable representation of the expected cost to perform this research effort.

EQUIPMENT COST. The proposed equipment was reviewed by the ARO technical monitor (see Attachment 2) and determined to be necessary to accomplish the statement of work. The proposed cost is predicated upon vendor quotes. The proposed cost is deemed reasonable based upon the advice of the ARO technical monitor.

GRAD STUDENT TUITION. The need for the proposed charges was reviewed by the ARO technical monitor (see Attachment 2) and determined to be required for the proposed research effort. The proposed costs are deemed reasonable based upon the advice of the technical monitor.

PUBLICATIONS/REPORTS. The benefit of the proposed publication/report cost was verified by the ARO tech monitor who recommended acceptance of same.

AMXRO-PR

SUBJECT: Request for Technical Review of Proposal No. 32850

TO: DR. CHANDRA

FROM: C. MESCHTER

1. Please refer to the attached budget for the subject proposal. This budget is in accordance with the funding guidelines provided.
2. To assist in completing the pricing of the proposal, please review the attached budget and provide recommendations with respect to the propriety of the following:
 - ✓ a. Direct Labor: The need for the types of personnel proposed and the time (hours/percentage of effort) proposed for each. Further, I request that you provide a recommendation on the acceptability of the proposed salaries. On an annualized basis, the principal investigator's rate equates to \$ 116K.
 - ✓ b. Travel: Need for the proposed travel and benefit to this project.
 - ✓ c. Equipment: Need for the proposed items and benefit to this project.
 - ✓ d. Publications/Reports: Requirement for and acceptability of the proposed cost.
 - ✓ e. Grad Student Tuition: Need/benefit of the proposed charges.

Carl Meschter
CARL MESCHTER

Attachment

29 JUN 94

SUBJECT: Technical Review of Proposal No.

TO:

FROM:


DATE:

I have reviewed the attached budget in accordance with instructions provided above. Based on my review:

☒ I recommend acceptance of the offeror's proposed costs without exception.

☐ I recommend acceptance of the offeror's proposed costs except for the following:

☐ Other (Specify)



Technical Monitor

APPROVED/DISAPPROVED

GEORGE A. NEECE
Director, Research &
Technology Integration

Date

7



DEPARTMENT OF THE ARMY
ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211



REPLY TO
ATTENTION OF

AMXRO-PR P-32850-MA

5 July 1994

SUBJECT: Agreement No. DAAH04-94-G-0267

US Army Research Office
ATTN: Dr. Jagdish Chandra
Mathematical and Computer Sciences Division
P. O. Box 12211
Research Triangle Park, NC 27709-2211

Pursuant to paragraph 42.9001 of the Army Federal Acquisition Regulations Supplement (AFARS) you are hereby designated to act as the undersigned Contracting Officer's Representative (COR) in administering the subject contract. Your designation as COR shall remain in effect through the life of the contract unless (i) sooner revoked by the undersigned or any successor Contracting Officer, or (ii) revoked by reason of your reassignment. You shall immediately inform the Contracting Officer in writing if at any time you are unable or anticipate becoming unable to perform your duties as COR because of reassignment or for any other reason.

The scope and limitations of your authority are defined in Enclosure 1, "Scope and Limitations of Authority of ARO COR's" dated 18 Oct 85. Your authority as COR is not redelegable.

Pursuant to AFARS 42.9004, both you and the contractor are required to acknowledge receipt of a copy of this designation on the original hereof and return it to the Contracting Officer.

Enclosure

PATSY S. ASHE
Contracting Officer

Agree with the above stipulations:

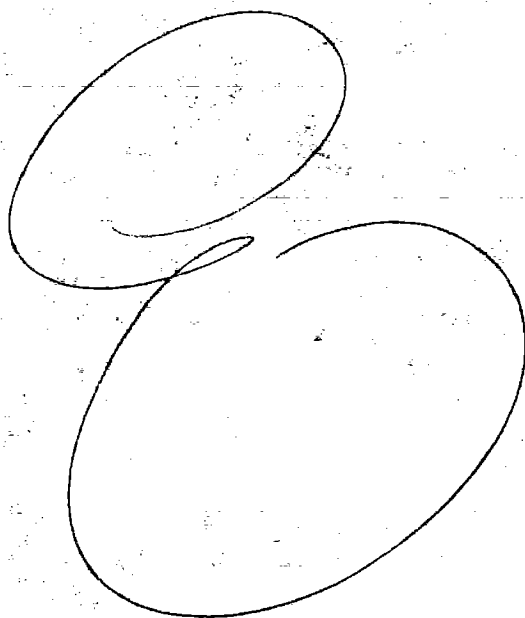
Contracting Officer's Representative

Date

Authorized Contractor Representative

Date

ARO FL 29
18 Oct 85



DD Form 2566, SEP 90

Award Basic

✓
U. S. ARMY RESEARCH OFFICE
4300 SOUTH MIAMI BLVD.
P. O. BOX 12211
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709-2211

RESEARCH GRANT SCHEDULE

1. ARO PROPOSAL NUMBER: P-32850-MA
2. GRANT NUMBER: DAAH04-94-G-0267
3. GRANTEE NAME AND ADDRESS: George Mason University
4400 University Drive
Fairfax, VA 22030-4444
4. PRINCIPAL INVESTIGATOR: Dr. Edward J. Wegman
5. STATEMENT OF WORK: The research to be accomplished is identified in the Grantee's proposal identified below which is incorporated by reference in this grant. The estimated cost of the research is set forth in the budget included as Exhibit A.
 - A. RESEARCH TITLE: VISUALIZATION METHODS FOR THE EXPLORATION OF HIGH DIMENSIONAL DATA
 - B. DATE OF PROPOSAL AND REVISIONS THERETO: 12 November 1993, as revised 3 June 1994
6. ARO SCIENTIFIC OFFICER: Dr. Jagdish Chandra
7. PERFORMANCE PERIOD: 15 July 1994 - 14 November 1995
8. A. AWARD AMOUNT: \$95,000
B. FUNDED AMOUNT TO DATE: \$15,000
C. FUNDED PERIOD: 15 July 1994 - 14 November 1994

See Article 14 of the "U.S. Army Research Office General Terms and Conditions for Grant Awards to Educational Institutions and Other Nonprofit Organizations" (Exhibit B) for restrictions on the Grantor's obligation to provide funding for research beyond that covered by funds provided above.

9. APPROPRIATION DATA:

2142040 46A-7270 P611102.H5705-2583 S31124 \$15,000

10. ADMINISTERED BY: U. S. Army Research Office and the Office of Naval Research. See Article 13 of Exhibit B for the identity of the administration duties delegated to the ONR. The ONR office that will perform these duties is identified below:

ONR, Resident Representative
101 Marietta Tower, Suite 2805
Atlanta, GA 30303

11. TERMS AND CONDITIONS: This grant is subject to the General Terms and Conditions set forth in the attached Exhibit B and to any Special Terms and Conditions contained in Item 17 of this Grant Schedule.

12. OPTIONS FOR ADDITIONAL PERIODS OF RESEARCH: This grant contains the following option(s):

Option No.	Amount	Number of Months
1	\$80,000	12
2	\$65,000	8

See Article 14 of Exhibit B for restrictions on the Grantor's obligation to exercise the option(s) identified above.

13. FUNDING INCREMENTS AND OPTIONS: The Grantor's obligation to provide funding for increments and/or options is pursuant to Article 14 of Exhibit B.

14. REPORTING REQUIREMENTS: Reporting Requirements are pursuant to Article 11 and Article 12 of Exhibit B.

15. PAYMENTS. Grant payments shall be made in accordance with the following schedule of payments:

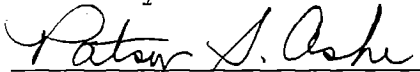
Payment No.	Payment Date	Payment Amount
1	15 July 1994	\$7,500
2	15 September 1994	\$6,750
3	Upon receipt of final technical report	\$ 750

The Grantee shall advise the Grants Officer if at any time an adjustment to the above payment schedule is required due to a variance between projected and experienced expenditures.

16. ACCEPTANCE OF GRANT: Acceptance of this grant is pursuant to Article 3 of Exhibit B.

17. SPECIAL TERMS AND CONDITIONS: None

UNITED STATES OF AMERICA
U.S. Army Research Office



PATSY S. ASHE

Grants Officer

Date: 05 JUL 1994

Attachments:

- Exhibit A Budget
- Exhibit B U. S. Army Research Office General Terms and Conditions
for Grant Awards to Educational Institutions and Other
Nonprofit Organizations
- Exhibit C ARO Form 18 (Attachement of Exhibit B)

SUMMARY PROPOSAL BUDGET

EXHIBIT A

Year 1 FY 94

OFFEROR George Mason University						FOR ARO USE ONLY						
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)				
						AWARD NO.		Proposed	Granted			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)	
								CAL	ACAD	SUMR		
1. E. Wegman										1	\$ 9,700	
2.												
3.												
4.												
5.												
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)												
7. (1) TOTAL SENIOR PERSONNEL (1-6)										1	9,700	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)												
1. () POST DOCTORAL ASSOCIATES												
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)												
3. () GRADUATE STUDENTS												
4. () UNDERGRADUATE STUDENTS												
5. () SECRETARIAL - CLERICAL												
6. () OTHER												
TOTAL SALARIES AND WAGES (A + B)											9,700	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											741	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											10,441	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)												
TOTAL PERMANENT EQUIPMENT												
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)												
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)												
2. FOREIGN												
F. PARTICIPANT SUPPORT COSTS												
1. STIPENDS \$												
2. TRAVEL												
3. SUBSISTENCE												
4. OTHER												
() TOTAL PARTICIPANT COSTS												
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)												
1. MATERIALS AND SUPPLIES												
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION												
3. CONSULTANT SERVICES												
4. COMPUTER (ADPE) SERVICES												
5. SUBCONTRACTS												
6. OTHER												
TOTAL OTHER DIRECT COSTS												
H. TOTAL DIRECT COSTS (A THROUGH G)											10,441	
I. INDIRECT COSTS												
47% of salaries and wages						Overhead	Rate	Base	Total			
						G & A						
						Fringe						
TOTAL INDIRECT COSTS						FCCM					4,559	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)											15,000	
K. FEE (%) (BASE \$)												
L. COST SHARING												
M. AMOUNT OF THIS REQUEST											15,000	
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/94		FOR ARO USE ONLY				
OFFERORS REP. TYPED NAME & SIGNATURE Jennifer O. Murphy						DATE 6/3/94						

SUMMARY PROPOSAL BUDGET

Year 2 FY 95

OFFEROR George Mason University						FOR ARO USE ONLY						
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)				
						Proposed		Granted				
AWARD NO.												
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)	
								CAL	ACAD	SUMR		
1. E. Wegman										2	\$ 24,383	
2.												
3.												
4.												
5.												
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)												
7. (1) TOTAL SENIOR PERSONNEL (1-6)										2	24,383	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)												
1. () POST DOCTORAL ASSOCIATES												
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)												
3. (1) GRADUATE STUDENTS											10,000	
4. () UNDERGRADUATE STUDENTS												
5. (1) SECRETARIAL - CLERICAL Grants Administrator											10,000	
6. () OTHER												
TOTAL SALARIES AND WAGES (A + B)											44,383	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											4,465	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											48,848	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)												
TOTAL PERMANENT EQUIPMENT											1,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)												
1. DOMESTIC (INCL CANADA AND U.S. POSSESSIONS)											1,250	
2. FOREIGN												
F. PARTICIPANT SUPPORT COSTS												
1. STIPENDS \$ _____												
2. TRAVEL _____												
3. SUBSISTENCE _____												
4. OTHER _____												
() TOTAL PARTICIPANT COSTS												
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)												
1. MATERIALS AND SUPPLIES												
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION											500	
3. CONSULTANT SERVICES												
4. COMPUTER (ADPE) SERVICES												
5. SUBCONTRACTS												
6. OTHER Tuition											7,542	
TOTAL OTHER DIRECT COSTS											8,042	
H. TOTAL DIRECT COSTS (A THROUGH G)											59,140	
I. INDIRECT COSTS												
47% of salaries and wages						Overhead	Rate	Base	Total			
						G & A						
						Fringe						
						FCCM					20,860	
TOTAL INDIRECT COSTS												
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)											80,000	
K. FEE (_____ %) (BASE \$ _____)												
L. COST SHARING												
M. AMOUNT OF THIS REQUEST											80,000	
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/94		FOR ARO USE ONLY				
OFFERORS REP TYPED NAME & SIGNATURE Jennifer O. Murphy						DATE 6/3/94						

SUMMARY PROPOSAL BUDGET

Year 3 FY 96

OFFEROR George Mason University						FOR ARO USE ONLY					
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)			
						Proposed		Granted			
AWARD NO.											
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)
								CAL	ACAD	SUMR	
1. E. Wegman										2	\$ 24,066
2.											
3.											
4.											
5.											
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)											
7. (1) TOTAL SENIOR PERSONNEL (1-6)										2	24,066
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)											
1. () POST DOCTORAL ASSOCIATES											
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)											
3. (1) GRADUATE STUDENTS											10,000
4. () UNDERGRADUATE STUDENTS											
5. (1) SECRETARIAL - CLERICAL Grant Administrator											10,500
6. () OTHER											
TOTAL SALARIES AND WAGES (A + B)											44,566
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											4,574
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											49,140
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY)											
TOTAL PERMANENT EQUIPMENT											1,000
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)											
1. DOMESTIC (INCL CANADA AND U.S. POSSESSIONS)											1,000
2. FOREIGN											
F. PARTICIPANT SUPPORT COSTS											
1. STIPENDS \$ _____											
2. TRAVEL _____											
3. SUBSISTENCE _____											
4. OTHER _____											
() TOTAL PARTICIPANT COSTS											
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)											
1. MATERIALS AND SUPPLIES											
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION											1,000
3. CONSULTANT SERVICES											
4. COMPUTER (ADPE) SERVICES											
5. SUBCONTRACTS											
6. OTHER Tuition											6,914
TOTAL OTHER DIRECT COSTS											7,914
H. TOTAL DIRECT COSTS (A THROUGH G)											59,054
I. INDIRECT COSTS											
						Overhead	Rate	Base	Total		
						G & A					
						Fringe					
						FCCM					
TOTAL INDIRECT COSTS											20,946
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)											80,000
K. FEE (____%) (BASE \$ _____)											
L. COST SHARING											
											80,000
M. AMOUNT OF THIS REQUEST											
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/96		FOR ARO USE ONLY			
OFFERORS REP TYPED NAME & SIGNATURE Jennifer O. Murphy, Dir., Sponsored Program Adm.						DATE 6/5/96					

SUMMARY PROPOSAL BUDGET

Year 4 FY 97

OFFEROR George Mason University						FOR ARO USE ONLY						
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward Wegman						PROPOSAL NO.		DURATION (MONTHS)				
						AWARD NO.		Proposed	Granted			
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other-Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		Funds Requested By Offeror	Funds Granted By ARO (If Different)	
								CAL	ACAD	SUMR		
1. E. Wegman										1	\$ 13,441	\$
2.												
3.												
4.												
5.												
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)												
7. (1) TOTAL SENIOR PERSONNEL (1-6)										1	13,441	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)												
1. () POST DOCTORAL ASSOCIATES												
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)												
3. (1) GRADUATE STUDENTS											10,000	
4. () UNDERGRADUATE STUDENTS												
5. (1) SECRETARIAL - CLERICAL Grants Administrator											11,025	
6. () OTHER												
TOTAL SALARIES AND WAGES (A + B)											34,466	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)											3,895	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)											38,361	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)												
TOTAL PERMANENT EQUIPMENT											1,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)												
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)											1,000	
2. FOREIGN												
F. PARTICIPANT SUPPORT COSTS												
1. STIPENDS \$												
2. TRAVEL												
3. SUBSISTENCE												
4. OTHER												
() TOTAL PARTICIPANT COSTS												
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)												
1. MATERIALS AND SUPPLIES											835	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION												
3. CONSULTANT SERVICES												
4. COMPUTER (ADPE) SERVICES												
5. SUBCONTRACTS												
6. OTHER Tuition											7,605	
TOTAL OTHER DIRECT COSTS											8,440	
H. TOTAL DIRECT COSTS (A THROUGH G)											48,801	
I. INDIRECT COSTS												
47% of salaries and wages						Overhead	Rate	Base	Total			
						G & A						
						Fringe						
TOTAL INDIRECT COSTS						FCCM					16,199	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)											65,000	
K. FEE () (%) (BASE \$)												
L. COST SHARING											65,000	
M. AMOUNT OF THIS REQUEST												
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/94				FOR ARO USE ONLY		
OFFERORS REP TYPED NAME & SIGNATURE Jennifer O. Murphy						DATE 6/3/94						

SUMMARY PROPOSAL BUDGET

Year FY 94-FY 97

OFFEROR George Mason University						FOR ARO USE ONLY				
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR Edward J. Wegman						PROPOSAL NO.	DURATION (MONTHS)			
							Proposed	Granted		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)						Man Hrs/Mos	Rate	Person-mos.		
								Funds Requested By Offeror		
								Funds Granted By ARO (If Different)		
						CAL	ACAD	SUMR		
1. E. Wegman								6	\$ 71,590	\$
2.										
3.										
4.										
5.										
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)										
7. (1) TOTAL SENIOR PERSONNEL (1-6)								6	71,590	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)										
1. () POST DOCTORAL ASSOCIATES										
2. () OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)										
3. (1) GRADUATE STUDENTS									30,000	
4. () UNDERGRADUATE STUDENTS										
5. (1) SECRETARIAL - CLERICAL Grant Administrator									31,525	
6. () OTHER										
TOTAL SALARIES AND WAGES (A + B)									133,115	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)									13,675	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)									146,790	
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM. ATTACH ADDITIONAL EXPLANATION PAGES, IF NECESSARY.)										
TOTAL PERMANENT EQUIPMENT									3,000	
E. TRAVEL (LIST ON BUDGET EXPLANATION PAGE)										
1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)									3,250	
2. FOREIGN										
F. PARTICIPANT SUPPORT COSTS										
1. STIPENDS \$ _____										
2. TRAVEL _____										
3. SUBSISTENCE _____										
4. OTHER _____										
() TOTAL PARTICIPANT COSTS										
G. OTHER DIRECT COSTS (ITEMIZE ON BUDGET EXPLANATION PAGE)										
1. MATERIALS AND SUPPLIES										
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION									2,335	
3. CONSULTANT SERVICES										
4. COMPUTER (ADPE) SERVICES										
5. SUBCONTRACTS										
6. OTHER Tuition									22,060	
TOTAL OTHER DIRECT COSTS									24,395	
H. TOTAL DIRECT COSTS (A THROUGH G)									177,436	
I. INDIRECT COSTS										
47% of salaries and wages						Overhead	Rate	Base	Total	
						G & A				
						Fringe				
						FCCM				
TOTAL INDIRECT COSTS									62,564	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)									240,000	
K. FEE (_____ %) (BASE \$ _____)										
L. COST SHARING										
M. AMOUNT OF THIS REQUEST									240,000	
PI/PD TYPED NAME & SIGNATURE Edward J. Wegman						DATE 6/3/94		FOR ARO USE ONLY		
OFFERORS REP TYPED NAME & SIGNATURE Jennifer O. Murphy						DATE 6/3/94				

**U.S. ARMY RESEARCH OFFICE GENERAL TERMS AND
CONDITIONS FOR GRANT AWARDS TO EDUCATIONAL
INSTITUTIONS AND OTHER NONPROFIT ORGANIZATIONS**

TABLE OF CONTENTS

1. Research Responsibility
2. Order of Precedence
3. Administration and Cost Principles
4. Amendment of the Grant
5. Waivers of OMB Circular Prior Approvals & Other Authorizations
6. Pre-Award Costs
7. Change in Performance Period
8. Unobligated Balances
9. Payments
10. Publications and Acknowledgement
11. Technical Reporting Requirements
12. Financial Reporting Requirements
13. Delegation of Administration Duties
14. Funding Increments and Options
15. Cost-Sharing
16. Title to Expendable and Nonexpendable Acquired Property
17. Program Income
18. Patents Rights
19. Rights in Technical Data and Computer Software
20. Disputes
21. Suspensions and Termination
22. Grantee Release and Assignment of Refunds, Rebates and Credits
23. Security
24. Officials Not to Benefit
25. Nondiscrimination
26. Access to Information
27. Civil Rights Act of 1964
28. Clean Air and Water
29. Certification Regarding Drug-Free Workplace
30. Certification Regarding Lobbying
31. Research Involving Recombinant DNA Molecules
32. Prohibition of Use of Human Subjects
33. Prohibition of Use of Laboratory Animals
34. Data Collection
35. Site Visit
36. Use of U.S.-Flag Carriers
37. Debarment
38. Acceptance of Grant

1. RESEARCH RESPONSIBILITY.

- a. The grantee will bear primary responsibility for the conduct of the research and will exercise judgment towards

attaining the stated research objectives within the limits of the grant's terms and conditions.

- b. The principal investigator(s) specified in the grant document will be continuously responsible for the conduct of the research project and will be closely involved with the research effort. The principal investigator, operating within the policies of the grantee, is in the best position to determine the means by which the research may be conducted most effectively.

- c. The grantee will advise the grantor if the principal investigator will, or plans to, devote substantially less effort to the work than specified in the budgetary portion of the grant document.

- d. The grantee will obtain the grantor's approval to change the principal investigator or to continue the research work during a continuous period in excess of three (3) months without the participation of an approved principal investigator.

- e. The grantee will obtain the grantor's approval to change:

- (1) The methodology or experiment when such is stated in the grant as a specific objective;

- (2) the stated objectives of the research effort; or

- (3) the phenomenon or phenomena under study.

2. ORDER OF PRECEDENCE

Any inconsistency or conflict in the terms or conditions specified in this grant shall be resolved according to the following order of precedence:

- a. The Research Grant Schedule

- b. General Terms and Conditions for Grant Awards to Educational Institutions and Other Nonprofit Organizations (Exhibit B of the Grant)

3. ADMINISTRATION AND COST PRINCIPLES

The following OMB Circulars and attachments thereto, effective the earlier of (i) the start date of this grant or (ii) the

date on which the grantee incurs costs to be assessed the grant, are incorporated as part of this grant by reference.

a. A-110, "Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Nonprofit Organizations."

b. A-21, "Cost Principles for Educational Institutions."

c. A-122, "Cost Principles for Nonprofit Organizations" (see note below).

d. A-88, "Indirect Cost Rates, Audit, and Audit Follow-up at Educational Institutions."

e. A-133, "Audits of Institutions of Higher Education and Other Nonprofit Organizations."

Note: For those nonprofit organizations specifically exempted from the provisions of OMB Circular A-122, Subpart 31.2 of the Federal Acquisition Regulation (FAR)(48 CFR Subpart 31.2) shall apply.

These regulations may be obtained from:

Office of Management and Budget
EOP Publications Office
New Executive Office Building
725 17th Street, N.W. Room 2200
Washington, DC 20503

Telephone: (202) 395-7332

4. AMENDMENT OF THE GRANT

The only method by which this grant can be amended is by a formal, written amendment signed by the grants officer. No other communications, whether oral or in writing, are valid.

5. WAIVERS OF OMB CIRCULAR PRIOR APPROVALS AND OTHER AUTHORIZATIONS

Prior Approvals. All prior approvals required by OMB Circulars A-21 and A-110 are waived except the following:

a. Change in the scope or objectives of the Research Project as required by Article I of these terms and conditions entitled "Research Responsibility."

b. Any request for additional funding.

c. Change in key personnel as required by Article I of these terms and conditions entitled "Research Responsibility."

d. Exclusive of supplies, material, equipment or general support services, the award of a subcontract or subgrant to

accomplish substantial programmatic work required in the agreement to be performed by the prime grantee.

e. Transfer of funds among all cost elements when the cumulative amount of all such transfers exceeds or is expected to exceed 15% of the total budget last approved by the grantor.

f. Unless identified in the budget incorporated as part of the grant, expenditures for general purpose equipment and specific purpose equipment costing \$1,000 or more.

g. Unless identified in the budget incorporated as part of the grant, expenditures for foreign travel.

h. Costs for foreign and domestic travel that exceed by more than 25% or \$500, whichever is greater, the cost for such effort included in the budget incorporated as part of the grant.

6. PRE-AWARD COSTS

The grantee may incur preaward costs of up to ninety (90) days prior to the start date of the grant agreement. Preaward costs as incurred by the grantee must be necessary for the effective and economical conduct of the project, and the costs must be otherwise allowable in accordance with the appropriate cost principles. Preaward costs are made at the grantee's risk. The incurring of preaward costs by the grantee does not impose any obligation on the grantor in the absence of appropriations, if an award is not subsequently made, or if an award is made for a lesser amount than the grantee expected.

7. CHANGE IN PERFORMANCE PERIOD

The grantee may make a one-time extension to the expiration period of the grant for a period up to 12 months. The grantee shall notify the grantor in writing within 30 calendar days after such extension. The grantee's extension must be initiated before the termination date of the grant.

8. UNOBLIGATED BALANCES

In the absence of any specific notice to the contrary, the grantee is authorized to carry forward unexpended balances to subsequent funding periods of the grant agreement.

9. PAYMENTS

Unless specified to the contrary in the Grant Schedule (Special Terms and conditions) payments to the grantee shall be by the use of a predetermined schedule of payments.

Grantees not receiving predetermined schedule of payments shall submit requests for payment using SF 270, Request for Advance or Reimbursement, no more frequently than monthly. The request shall be submitted to the activity identified in Item 10 of the Grant Schedule.

10. PUBLICATION AND ACKNOWLEDGEMENT

a. **Publication.** The grantee is encouraged to publish results of the research, unless classified, in appropriate journals. One copy of each paper planned for publication will be submitted to the Scientific Officer simultaneously with its submission for publication. Copies of all publications resulting from the research will be forwarded to the grantor as they become available even though publication may in fact occur subsequent to the termination date of this grant.

b. **Acknowledgement.** The grantee agrees that in the release of information relating to this grant, such release shall include a statement to the effect that the project or effort depicted was or is sponsored by the Department of the Army, Army Research Office, and that the content of the information does not necessarily reflect the position or the policy of the government, and no official endorsement should be inferred. For purposes of this article, information includes news releases, articles, manuscripts, brochures, advertisements, still and motion pictures, speeches, trade association proceedings, etc.

c. **Disclosure of Federal Funding.** When issuing statements, press releases, requests for proposals, bid solicitations and other documents describing projects or programs funded in whole or in part with federal money, all grantees receiving federal funds, including but not limited to state and local governments, shall clearly state: (1) the percentage of total cost of the program or project which will be financed with federal money and (2) the dollar amount of federal funds for the project or program. (Section 8136, FY 1989 DOD Appropriations Act).

11. TECHNICAL REPORTING REQUIREMENTS

Technical reporting requirements are set forth in the U.S. Army Research Office Reporting Instructions (ARO Form 18). A copy of the reporting requirements is attached.

12. FINANCIAL REPORTING REQUIREMENTS

The following financial reports are required for grantees receiving funds advanced by Treasury checks:

a. **Federal Cash Transaction Report (SF 272)** (Quarterly): Within 15 working days following the end of each quarter.

b. **Financial Status Report (SF 269) (Final):** At completion of grant.

For grantees receiving funds by reimbursement, the following financial reports are required:

a. **Financial Status Report (SF 269) (Final):** At completion of grant.

b. **Federal Cash Transaction Report (SF 272):** Annually.

All reports shall be submitted to the Office of Naval Research Office identified in the Research Grant Schedule.

13. DELEGATION OF ADMINISTRATION DUTIES

Certain grant administration duties have been delegated to the Office of Naval Research identified in Item 10 of the Research Grant Schedule. These duties are listed below:

a. Provisionally approve all Requests for Advance or Reimbursement (SF 270).

b. Perform all property administration duties (Attachment N, OMB Circular A-110) except the approval of grantee requests to purchase equipment with grant funds. Such approval must be granted by the ARO grant officer.

c. Perform all plant clearance functions.

d. Approve requests for Registration of Scientific and Technical Information Services (DD Form 1540).

e. Obtain the interim (if required) and final financial report(s).

f. Obtain the interim patent report(s).

g. Upon expiration of the grant:

(1) Obtain the final Report of Inventions and Subcontracts (DD Form 882).

(2) Obtain final payment request, if any.

(3) Obtain final property report and dispose of purchased property and GFE in accordance with Attachment N of OMB Circular A-110.

(4) Obtain the Grantee Release and Assignment of Refunds, Rebates, Credits and Other Amounts.

(5) Perform a review of final incurred costs and assist the grant officer in resolving exceptions, if any, resulting from costs questioned.

(6) Assure that all refunds due the Government are received by the grant officer.

14. FUNDING INCREMENTS AND/OR OPTIONS

The grantee is advised that the grantor's obligation to provide funding for funding increments and/or options included in the grant is contingent upon (i) satisfactory performance and (ii) the availability of funds. Accordingly, no legal liability on the part of the grantor exists unless or until (i) funds are made

available to the grantor and notice of such availability is confirmed in writing to the grantee and (ii) performance of the research is deemed satisfactory in the judgment of the scientific officer.

15. COST-SHARING

Cost-sharing amounts, if any, identified in the grant documents must meet the allocability test of the appropriate cost principles identified in Article 3 of these Terms and Conditions. If at the end of the grant period the actual cost of the research project is less than the project cost negotiated, the actual cost will be allocated between the grantor and the grantee in the dollar ratio originally proposed. Excess grantor funds will be returned to the government. If the grant officer approves a significant departure from the original research objectives, the grantee may request that the negotiated cost-sharing percentage be adjusted.

16. TITLE TO EXPENDABLE AND NONEXPENDABLE ACQUIRED PROPERTY

Unless specified otherwise in the "Special Terms and Conditions" paragraph of the grant agreement, title to all nonexpendable and expendable tangible personal property purchased with grant funds shall be vested in the grantee upon acquisition subject to the provisions of Attachment N, OMB Circular A-110.

17. PROGRAM INCOME

All program income earned except (i) interest on advances of funds, (ii) proceeds from the sale of real and personal property and (iii) royalties received as a result of copyrights or patents produced under the grant shall be deducted from the total project costs in determining the net costs on which the grantor share of costs will be based.

18. PATENT RIGHTS

The patent rights clause, "Rights to Inventions Made to Nonprofit Organizations and Small Business Firms" (37 CFR Part 401) is incorporated as part of the grant by reference. Invention reports shall be filed at least annually and at the end of the period of the grant. Annual Reports are due 60 days after the anniversary date of the grant and final reports are due 6 months after the expiration of the final research period. The grantee shall use DD Form 882, Report of Inventions and Subcontracts, to file the invention reports. Negative reports are required. The grant shall not be closed out until all invention reporting requirements are met.

19. RIGHTS IN TECHNICAL DATA AND COMPUTER SOFTWARE

Rights in technical data and computer software under this grant shall be as specified in the DOD FAR Supplement

(DFARS 252.227-7013, Rights in Technical Data and Computer Software)(OCT 1988) which is incorporated by reference.

20. DISPUTES

Disagreements regarding matters of fact between the grantee and the grantor which arise during performance of the grant shall be resolved by negotiation to the maximum extent practicable. If agreement cannot be reached, the grant officer will issue a final decision in writing to the grantee. The final decision will permit the grantee to appeal the decision within 30 days after receipt of such notification. Appeals will be resolved at the Headquarters, Department of Army level. A decision will be final and not subject to further administrative appeal.

21. SUSPENSION AND TERMINATION

a. **Suspension.** When the grantee has failed to comply with the terms of the grant agreement, the grantor may, upon reasonable written notice, temporarily suspend performance under the grant. Such suspension will be without further payments and will prohibit the grantee from incurring additional obligations pending corrective action by the grantee or a decision to terminate by the grantor. The grant officer shall notify the grantee in writing of the suspension and specify the effective date of the suspension and, where practicable, the duration of the suspension. The grantor shall allow all necessary and proper costs which the grantee could not reasonably avoid during the period of suspension provided such costs are in accordance with applicable cost principles.

b. **Termination.** The grantor may terminate the grant in whole or in part for:

(1) **Cause.** Termination may occur at any time before the date of completion if the grantor determines that the grantee has failed to comply with the conditions of the grant. Payments made to the grantee or recoveries made by the grantor shall be within the legal rights and liabilities of the parties.

(2) **Convenience.** When both parties agree that continuing the project would not result in benefits commensurate with expending more funds, they may agree to terminate the grant. Termination conditions shall include the effective date of termination. In case of partial termination, the portion to be discontinued must be specified. Grantees shall cancel as many outstanding obligations as possible and shall not incur new obligations after the effective date of termination. The grantee shall be allowed full credit for the federal share of the noncancelable obligations properly incurred before termination.

22. GRANTEE RELEASE AND ASSIGNMENT OF REFUNDS, REBATES, CREDITS AND OTHER AMOUNTS.

The grantee shall submit these reports not later than ninety (90) days after completion of the grant.

23. SECURITY

As a general rule, principal investigators will not need access to classified security information in the conduct of research supported under this grant. Should it appear that access to such information is desirable, the grantee shall advise the grantor and request clearance for the investigator. Should information be developed under the course of work under this grant that, in the judgment of the principal investigator or the grantee, should be classified, the grantor shall be notified immediately.

24. OFFICIALS NOT BE BENEFIT

No member of or delegate to Congress, or resident Commissioner, will be admitted to any share or part of the grant, or to any benefits that may arise therefrom.

25. NONDISCRIMINATION

a. **Employment.** In connection with performance of work under this grant, the grantee agrees not to discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. This provision will include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

b. **Educational Institutions.** If the grantee is an educational institution, the grantee agrees not to discriminate on the basis of race, color, creed, sex, or national origin against any student in selection of personnel for graduate or technical work related to the grant.

26. ACCESS TO INFORMATION

The grantee agrees to permit any person or persons designated by the grantor access during normal business hours to such books, records, accounts and other sources of information, and facilities as is reasonably necessary to ascertain compliance with the provisions of this article.

27. CIVIL RIGHTS ACT OF 1964

The grantee shall comply with the Civil Rights Act of 1964 and implementing regulations.

28. CLEAN AIR AND WATER

If the amount of this grant exceeds \$100,000, the grantee shall comply with the Clean Air Act of 1970 (42 U.S.C. 1857), as amended; the Federal Water Pollution Control Act (33 U.S.C. 1251), as amended; Executive Order No. 11738; and the related regulations of the Environmental Protection Agency (40 CFR, Part 15).

29. CERTIFICATION REGARDING DRUG-FREE WORKPLACE

By acceptance of the grant document, the grantee acknowledges CFR, Appendix C to Part 280, "Certification Regarding Drug-Free Workplace Requirements, Alternate 1." The place of performance as specified in the technical proposal shall constitute the grantee's designation of the site for the performance of work done in connection with this grant.

30. CERTIFICATION REGARDING LOBBYING

If the amount of this grant exceeds \$100,000, the grantee acknowledges 31 U.S.C. 1352, "Limitation on Use of Appropriated Funds to Influence Certain Federal Contracting and Financial Transactions."

31. RESEARCH INVOLVING RECOMBINANT DNA MOLECULES

Any grantee performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules agrees by acceptance of this award to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," Nov 1984 (49 FR46266-46291), or such later revision of those guidelines as may be published in the Federal Register.

32. PROHIBITION OF USE OF HUMAN SUBJECTS

Notwithstanding any other provisions contained in this grant or incorporated by reference herein, the grantee is expressly forbidden to use or subcontract for the use of human subjects in any manner whatsoever. In the performance of this grant, the grantee agrees not to come into contact with, use or employ, or subcontract for those or employ of any human subject for research, experimentation, test or other treatment under the scope of works as set out in the grant without the express written approval from the grant officer.

33. PROHIBITION OF USE OF LABORATORY ANIMALS

Notwithstanding any other provisions contained in this grant or incorporated by reference herein, the grantee is expressly forbidden to use or subcontract or subgrant for the use of

laboratory animals in any manner whatsoever without the express written approval of the grant officer.

34. DATA COLLECTION

Data collection activities, if any, performed under this project are the responsibility of the grantee, and awarding agency support of the project does not constitute approval of any survey design, questionnaire content, or data collection procedures. The grantee shall not represent to respondents that such data are being collected for or in association with the awarding agency without the specific written approval of the grant officer. However, this requirement is not intended to preclude mention of awarding agency support of the project in response to an inquiry or to preclude acknowledgement of such support in any publication of this data.

35. SITE VISITS

The grantor, through authorized representatives, has the right during normal business hours, to make site visits to review project accomplishments and to provide such technical assistance as may be required. If any site visit is made by the grantor on the premises of the grantee, a subgrantee, or contractor, the grantee shall provide, and shall require its subgrantees and contractor to provide, all reasonable facilities and assistance for the safety and convenience of the government representatives in the performance of their duties. All site visits and evaluations shall be performed in such a manner as will not unduly interfere with or delay the work.

36. USE OF U.S.-FLAG AIR CARRIERS

a. The Comptroller General of the United States, by Decision B-138942 of June 17, 1975, as amended March 31, 1981, provided guidelines for implementation of Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974.

b. Any air transportation to, from, between, or within a country other than the U.S., of persons or property, the expense of which will be assisted by this award, must be performed on a U.S.-flag air carrier if service provided by such carrier is "available."

c. The following rules apply unless the result would be use of a foreign air carrier ("foreign carrier") for the first or last leg of travel from or to the U.S.:

(1) A U.S.-flag air carrier ("U.S. carrier") shall be used to destination or, in the absence of through service, to farthest interchange point.

(2) If a U.S. carrier does not serve an origin or interchange point, a foreign carrier shall be used to the nearest interchange point to connect with a U.S. carrier.

(3) If a U.S. carrier involuntarily reroutes the traveler via a foreign carrier, the foreign carrier may be used.

d. Exceptions. In the following situations, use of a foreign carrier is permissible:

(1) Travel to and from the U.S. Use of a foreign carrier is permissible if:

(a) The airport abroad is the origin or destination airport, and use of a U.S. carrier would extend the total travel time 24 hours or more than would travel by foreign carrier; or

(b) The airport abroad is an interchange point, and use of a U.S. carrier would require the traveler to wait six (6) hours or more to make connection or would extend the total travel time six (6) hours or more than would travel by foreign carrier.

(2) Travel Between Points Outside the U.S. Use of a foreign carrier is permissible if:

(a) Travel by foreign carrier would eliminate two (2) or more aircraft en route; or

(b) Travel by U.S. carrier would extend the total travel time six (6) hours or more than would travel by foreign carrier.

(3) Short Distance Travel. For all short distance travel, regardless of origin and destination, use of a foreign carrier is permissible if the elapsed travel time on a scheduled flight from origin to destination airport by foreign carrier is three (3) hours or less and service by U.S. carrier would double the travel time.

37. DEBARMENT & SUSPENSION

This award is subject to any DoD regulations that provide for debarring organizations or individuals from eligibility to participate under financial assistance programs.

38. ACCEPTANCE OF GRANT

The recipient is not required to countersign the grant document; however, the grantee agrees to the conditions specified in the Grant Schedule and the Articles herein unless notice of disagreement is furnished the grant officer within 15 calendar days after the date of grant officer signature. In case of disagreement, the grantee shall not assess the grant any costs of the research unless and until such disagreement(s) is resolved.

Pre-Award

Mod 1



DEPARTMENT OF THE ARMY
ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211



REPLY TO
ATTENTION OF

DEC 15 1994

Procurement Office

Subject: Proposal No. P-32850-MA, Modification P00001
to Grant No. DAAH04-94-G-0267

George Mason University
ATTN: Ms Margaret Hanson
Sponsored Program Administration
4400 University Drive
Fairfax, Virginia 22030

CONCURRENCE		
BRANCH CHIEF		
CLOSING CLK		
AUTHOR		
TYPIST		

Dear Ms Hanson:

Enclosed for your retention is a duplicate original of the
subject modification.

Sincerely,

PSA

Patsy S. Ashe
Grants Officer

Enclosure

Copy Furnished:

ONR

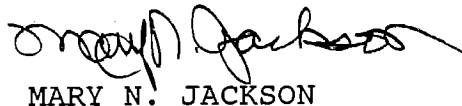
AMXRO-PR (32850-MA)

15 Dec 94

MEMORANDUM FOR AMXRO-LO

SUBJECT: Modification No. P00001 to Agreement No. DAAH04-94-G-0267
with George Mason University

Subject funding action is submitted for your review. Request that
this proposed award be reviewed for legal sufficiency.

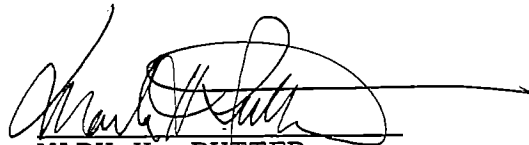


MARY N. JACKSON

AMXRO-PR 1st End

FOR AMXRO-PR

The proposed funding action has been reviewed and is determined to be
legally sufficient.



MARK H. RUTTER

Chief Counsel

Date: 15 Dec 94

PURCHASE REQUEST AND COMMITMENT <small>For use of this form, see AR 37-1; the proponent agency is OASA(FM)</small>			1. PURCHASE INSTRUMENT NO. 95-56		2. REQUISITION NO.		3. DATE 9 Dec 94		PAGE OF PAGES	
4. TO: Purchasing & Contracting Officer			5. THRU: Resource Management Office			6. FROM: Mathematical & Computer Sciences Div.				
It is requested that the supplies and services enumerated below or on attached list be										
7. PURCHASED FOR Mathematical & Computer Sciences Division						8. DELIVERED TO			9. NOT LATER THAN (Date)	
The supplies and services listed below cannot be secured through normal supply channels or other Army supply sources in the immediate vicinity, and their procurement will not violate existing regulations pertaining to local purchases for stock, therefore, local procurement is necessary for the following reason: (Check appropriate box and complete item.)						10. NAME OF PERSON TO CALL FOR ADDITIONAL INFORMATION			11. TELEPHONE NUMBER	
12. LOCAL PURCHASES AUTHORIZED AS THE NORMAL MEANS OF SUPPLY FOR THE FOREGOING BY				13. REQUISITIONING DISCLOSES NONAVAILABILITY OF ITEMS AND LOCAL PURCHASE IS AUTHORIZED BY		FUND CERTIFICATION				
EMERGENCY SITUATION PRECLUDES USE OF REQUISITION CHANNELS FOR SECURING ITEM						The supplies and services listed on this request are properly chargeable to the following allotments, the available balances of which are sufficient to cover the cost thereof, and funds have been committed.				
14. ITEM	15. DESCRIPTION OF SUPPLY OR SERVICES	16. QUANTITY	17. UNIT	18. ESTIMATED		19. ACCOUNTING CLASSIFICATION AND AMOUNT				
				UNIT PRICE <i>a</i>	TOTAL COST <i>b</i>	2152040 56A-7270 P611102.H5705-2583 S31124 \$ 80,000				
	RESEARCH CONTRACT PROPOSAL NO. 32850-MA (Wegman) George Mason University Request funding of option to Contract No. DAAH04-94-G-0267 for research to be conducted for the period 1 November 1994 through 14 November 1995. Funding to be: \$80,000 FY95 Math funds. R&D Project No1. & Title: 1L161102 BH57-05 MA				\$80,000	20. TYPED NAME AND TITLE OF CERTIFYING OFFICER Susan Linens Budget Analyst		21. SIGNATURE <i>Susan Linens</i>	22. DATE 12/12/94	
						23. DISCOUNT TERMS FY94- 98%				
						24. PURCHASE ORDER NUMBER				
25. THE FOREGOING ITEMS ARE REQUIRED NOT LATER THAN AS INDICATED ABOVE FOR THE FOLLOWING PURPOSE						26. DELIVERY REQUIREMENTS ARE MORE THAN 7 DAYS REQUIRED TO INSPECT AND ACCEPT THE REQUESTED GOODS OR SERVICES YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES, NUMBER OF DAYS REQUIRED				
27. TYPED NAME AND GRADE OF INITIATING OFFICER JAGDISH CHANDRA, SES-4		28. SIGNATURE <i>Jagdish Chandra</i>			29. DATE 9 Dec 94		34. TYPED NAME AND GRADE OF APPROVING OFFICER OR DESIGNEE		35. SIGNATURE	36. DATE
30. TELEPHONE NUMBER (919) 549-4254										
31. TYPED NAME AND GRADE OF SUPPLY OFFICER		32. SIGNATURE			33. DATE					

Fund per plan - 12/12/94

Award

Mod 1

U.S. ARMY RESEARCH OFFICE
4300 SOUTH MIAMI BLVD.
P. O. BOX 12211
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709-2211

RESEARCH GRANT SCHEDULE

1. ARO PROPOSAL NUMBER: P-32850-MA
2. GRANT NUMBER: DAAH04-94-G-0267
3. MODIFICATION NUMBER: P00001
4. GRANTEE NAME AND ADDRESS: George Mason University
4400 University Drive
Fairfax, Virginia 22030-4444
5. PRINCIPAL INVESTIGATOR(S): Dr. Edward J. Wegman
6. GRANTEE REQUEST FOR MODIFICATION (IF APPLICABLE): N/A
7. DESCRIPTION OF MODIFICATION:

A. Article 8 of the Grant Schedule is changed as shown below to increase the Grantor's funding obligation under the research project:

	<u>Funded Amount</u>
Previous Amount	\$15,000
Amount of Increase	<u>80,000</u>
Revised Amount	\$95,000

The following is a summary to date of the award amount and funded amount under the subject grant:

ARTICLE 8 A. AWARD AMOUNT: \$95,000

ARTICLE 8 B. FUNDED AMOUNT: \$95,000

ARTICLE 8 C. FUNDED PERIOD: 15 July 1994 - 14 November 1995

B. Article 9 entitled APPROPRIATION DATA is modified to include the following:

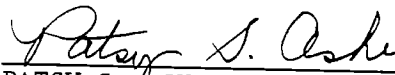
2152040 56A-7270 P611102.H5705-2583 S31124 \$80,000

C. Grant payments for the amount of the increase shall be made in accordance with the following schedule of payments:

<u>Payment No.</u>	<u>Payment Date</u>	<u>Payment Amount</u>
1	20 December 1994	\$20,000
2	20 February 1995	\$20,000
3	20 May 1995	\$20,000
4	20 August 1995	\$18,000
5	Upon receipt of Final Technical Report	\$ 2,000

The grantee shall advise the grant officer if at any time an adjustment to the above payment schedule is required due to a variance between projected and experienced expenditures. All other provisions remain unchanged.

UNITED STATES OF AMERICA
U.S. Army Research Office



PATSY S. ASHE
Grants Officer
Date: 15 DEC 1994

Pre-Award

Mod 2



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211

01 DEC 1995



Procurement Office

Subject: Proposal No. P-32850-MA, Modification P00002 to
Grant No. DAAH04-94-G-0267

George Mason University
Attn: Ms Margaret Hanson
Sponsored Program Administration
4400 University Drive
Fairfax, Virginia 22030

CONCURRENCE		
BRANCH CHIEF		
CLOSING CLK		
AUTHOR	PA	
TYPIST	Me	27 Sep

Dear Ms Hanson:

Enclosed for your retention is the duplicate original signed copy
of the subject modification.

Sincerely,

Patsy S. Ashe
Grants Officer

Enclosure

Copy Furnished:

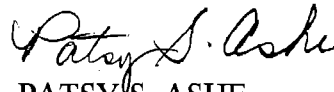
ONR



AMXRO-PR P-32850-MA

MEMORANDUM FOR AMXRO-LO


SUBJECT: Grant Award Approval for Grant No. DAAH04-94-G-0267,
Modification P00002


PATSY S. ASHE
Grants Officer 2 Oct 1995

AMXRO-LO 1st End

FOR AMXRO-PR

The above described proposed grant modification is considered legally sufficient and approval of award is recommended.


MARK H. RUTTER
Legal Counsel 10/10/95

PURCHASE REQUEST AND COMMITMENT For use of this form, see AR 37-1; the proponent agency is OASA(FM)			1. Purchase Instrument No. 96-26		2. Requisition No.		3. Date 7 September 1995		PAGE 1 of 1	
4. TO: Purchasing & Contracting Officer			5. THRU: Resource Management Office			6. FROM: Math & Computer Sciences Div.				
It is requested that the supplies and services enumerated below or on attached list be										
7. Purchased For Mathematical & Computer Sciences Division				8. Delivered To				9. Not Later Than (Date)		
The supplies and services listed below cannot be secured through normal supply channels or other Army supply sources in the immediate vicinity, and their procurement will not violate existing regulations pertaining to local purchases for stock, therefore, local procurement is necessary for the following reason: (Check appropriate box and complete item).							10. NAME OF PERSON TO CALL FOR ADDITIONAL INFORMATION		11. TELEPHONE NO.	
12. LOCAL PURCHASES AUTHORIZED AS THE NORMAL MEANS OF SUPPLY FOR THE FORGOING BY			13. REQUISITIONING DISCLOSES NONAVAILABILITY OF ITEMS AND LOCAL PURCHASE IS AUTHORIZED BY			FUND CERTIFICATION The supplies and services listed on this request are properly chargeable to the following allotments, the available balances of which are sufficient to cover the cost thereof, and funds have been committed				
EMERGENCY SITUATION PRECLUDES USE OF REQUISITION CHANNELS FOR SECURING ITEM										
14. Item	15. DESCRIPTION OF SUPPLY OR SERVICES	16. QUANTITY	17. Unit	18. ESTIMATED UNIT PRICE <i>a</i> TOTAL COST <i>b</i>		19. ACCOUNTING CLASSIFICATION AND AMOUNT				
1	RESEARCH CONTRACT PROPOSAL NO. 32850-MA (Wegman) George Mason University Request funding of option to Contract No. DAAH04-94-G-0267 for research to be conducted for the period 15 November 1995 thru 14 November 1996. Funding to be: \$80,000 FY96 Math funds. R&D Project No. & Title: 1L161102 BH57-05 MA				\$80,000	2162040 66A-7270 P611102.H5705-2583 S31124 6H5705/6MA32850/6AROX94XGX0267 \$80,000 (SUBJECT TO AVAILABILITY OF FUNDS)				
						20. TYPED NAME AND TITLE OF CERTIFYING OFFICER SUSAN LINENS, Budget Analyst		21. SIGNATURE <i>Susan Linens</i>		22. DATE 9 Sep 95
						23. DISCOUNT TERMS FY95 - PS			24. PURCHASE ORDER NUMBER	
						25. THE FOREGOING ITEMS ARE REQUIRED NOT LATER THAN AS INDICATED ABOVE FOR THE FOLLOWING PURPOSE				
27. TYPED NAME AND GRADE OF INITIATING OFFICER JAGDISH CHANDRA, SES-4		28. SIGNATURE <i>Jagdish Chandra</i>		29. DATE 7 September 1995		34. TYPED NAME AND GRADE OF APPROVING OFFICER OR DESIGNEE		35. SIGNATURE		36. DATE
30. TELEPHONE NO. x4254										
31. TYPED NAME AND GRADE OF SUPPLY OFFICER		32. SIGNATURE		33. DATE						

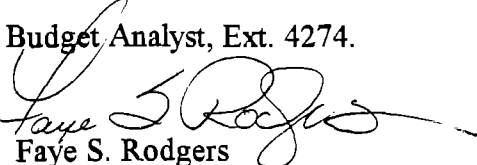
AMXRO-RM

30 November 1995

MEMORANDUM FOR AMXRO-PR, Janet Lockhart

SUBJECT: Release of "Subject to Availability" Status

1. Attached is a listing of proposals that are released from "Subject to Availability" status and can now be awarded. The total amount released is \$ 5,025,683.
2. Questions regarding this action may be directed to Susan Linens, Budget Analyst, Ext. 4274.



Faye S. Rodgers
Resource Manager

DTR> Print pro_nu, findamt, prfpref of current sorted by prfpref, findamt

PRO NU	FINDAMT	PRFPREF
30599CH	\$22,500	30-Sep-1995
32186MA	\$64,210	30-Sep-1995
32823MS	\$74,640	30-Sep-1995
30685GS	\$79,999	30-Sep-1995
32620MS	\$100,000	30-Sep-1995
32352MS	\$105,000	30-Sep-1995
32146MS	\$116,030	30-Sep-1995
32881MA	\$83,000	3-Oct-1995
32628EL	\$80,007	5-Oct-1995
31038CH	\$68,000	31-Oct-1995
32430EL	\$70,000	31-Oct-1995
32658CH	\$70,000	31-Oct-1995
32846MA	\$75,000	31-Oct-1995
34811MA	\$90,000	31-Oct-1995
33174MS	\$100,000	31-Oct-1995
32560EG	\$114,517	31-Oct-1995
33035EL-JSE	\$1,500,000	9-Nov-1995
32168CH	\$75,000	14-Nov-1995
32850MA	\$80,000	14-Nov-1995
31049CH	\$96,065	14-Nov-1995
30653EL	\$42,000	19-Nov-1995
33159MA	\$165,000	19-Nov-1995
33134MS	\$110,000	21-Nov-1995
30729EG	\$12,556	30-Nov-1995
30537EG	\$20,000	30-Nov-1995
31164PH	\$30,000	30-Nov-1995
31498PH	\$34,999	30-Nov-1995
30459EL	\$38,000	30-Nov-1995
32922MA	\$43,000	30-Nov-1995
33043LS	\$49,061	30-Nov-1995
31068PH	\$50,000	30-Nov-1995
32320MA	\$50,000	30-Nov-1995
34480MS	\$60,000	30-Nov-1995
33659MS	\$65,570	30-Nov-1995
31392CH	\$70,000	30-Nov-1995
32545CH	\$75,000	30-Nov-1995
33896EG	\$80,000	30-Nov-1995
33497CH	\$80,000	30-Nov-1995
33931MA	\$80,000	30-Nov-1995
34699MA	\$80,000	30-Nov-1995
34589LS	\$83,253	30-Nov-1995
32362MS	\$84,980	30-Nov-1995
33137MS	\$87,780	30-Nov-1995
32508CH	\$90,000	30-Nov-1995
33529MA	\$90,000	30-Nov-1995
34040MS	\$90,588	30-Nov-1995
31597MS	\$99,958	30-Nov-1995
34553EL	\$99,970	30-Nov-1995

+ 5,025,683

INDIVIDUAL GRANT ACTION REPORT

INTERAGENCY REPORT
CONTROL NUMBER
0252-DOC-QU

PART A	A1 TYPE OF REPORT 0 Original 1 Cancelling 2 Correcting 0		A2 REPORT NO		A3 CONTRACTING OFFICE CODE AH04	
	B1 DUNS NUMBER		B2 CAGE CODE		B3 INSTITUTION CODE	
PART B	B4 GRANTEE NAME AND DIVISION NAME George Mason University		B7 GRANTEE ADDRESS (Street, City, State) 4400 University Dr. Fairfax, VA		B5 PARENT TIN	
	B6 GRANTEE CITY OR PLACE CODE 26496		B8 GRANTEE STATE OR COUNTRY CODE 51		B9 ZIP CODE 22030-4444	
PART C	B11 TYPE OF GRANTEE 1 State Government 2 County Government 3 Municipal Government 4 Special District Government 5 Independent School District 6 State Controlled Institutions of Higher Education 7 Indian Tribe 8 Nonprofit Agency (Other than Educational) 9 Private Higher Education Institution 10 Individual 11 Profit Organization (Not a Small Business) 12 Small Business 13 All Other 9				B12 OTHER GRANTEE INFORMATION 1 Historically Black Colleges and Universities 2 Minority Institution 3 Foreign University 4 Foreign Nonprofit Organization 5 Federally Funded Research and Development Center (Academic) 6 Federally Funded Research and Development Center (Nonprofit) 7 Not Applicable 7	
	C1 GRANT NUMBER 44-G-0267		C2 MOD NUMBER P00002		C3 PROJECT ENDING DATE (YYMMDD)	
PART D	C4 TYPE OF ACTION 1 New Grant Award 2 Subsequent Incremental Funding Action 3 Exercise of Option, Additional Research Revision of Research Proposal 4 Funding Adjustment to Completed Project 3		C7A FEDERAL OBLIGATION AMOUNT (Enter whole dollars only) 80,000		C7B FEDERAL OBLIGATION SIGN 1 Obligation 2 Deobligation	
	C7C NONFEDERAL OBLIGATION AMOUNT (Enter whole dollars only)		C7D NONFEDERAL OBLIGATION SIGN 1 Obligation 2 Deobligation		C8 TOTAL FEDERAL VALUE OF GRANT (Enter whole dollars only)	
PART E	C10 TYPE OF AWARD 1 Revenue Sharing 2 Block Grant 3 Formula Grant 4 Project Grant 5 Cooperative Agreement 6 Direct Payment (Specific Use) 7 Direct Loan 8 Guaranteed Loan 9 Insurance 10 Direct Payment (Restricted Use) 11 Other Reimbursable Contingent Intangible Indirect 4				C11 CFDA NUMBER 12.431	
	C12 PROJECT DESCRIPTION Visualization Methods For The Exploration of High Dimensional Data					
PART F	C13 PRIMARY ADMINISTERING AGENCY 2100		C14 PRINCIPAL PLACE OF PERFORMANCE C14A CITY OR PLACE CODE 26496 C14B STATE OR COUNTRY CODE 51		C15 TYPE OF FUNDS 1 Research 2 Exploratory Development 3 Advanced Development 4 Engineering Development 5 Operational Systems Development 6 Management and Support 7 Other 1	
	C16 AGENCY APPROPRIATION 1 ARMY 2 DHA 3 SOHO 4 OSD 5 DARPA 6 AF 7 NSA 8 DNA 9 DCA 10 DIA 11 USMC 12 NAVY 13 DIA 14 USUHS 15 Non-DOO 1		C17 EXTENT COMPETED 1 Completed Action 2 Not Available for Competition 3 Follow-on to Completed Action 4 Not Completed 1			
PART G	C18 CATEGORY OF SUPPORT (Choose one category)		C19 CATEGORY OF SCIENCE AND ENGINEERING		C20 CATEGORY OF SCIENCE AND ENGINEERING	
	C18A RESEARCH AND DEVELOPMENT		C19A		C20A	
PART H	C18B FELLOWSHIPS TRAINEESHIPS		C19B		C20B	
	C18C R & D PLANT		C19C		C20C	
PART I	C18D FACILITIES AND EQUIPMENT FOR SCIENCE AND ENGINEERING (DoD instrumentation)		C19D		C20D	
	C18E GENERAL SUPPORT FOR SCIENCE AND ENGINEERING		C19E		C20E	
PART J	C18F OTHER ACTIVITIES RELATED TO SCIENCE AND ENGINEERING (Conference/Symposium)		C19F		C20F	
	C18G ALL OTHER ACTIVITIES NOT RELATED TO SCIENCE AND ENGINEERING		C19G		C20G	
PART K	D1 NAME OF CONTRACTING OFFICER OR REPRESENTATIVE (Last, First, Middle Initial) ASHE, PATSY S.		D2 SIGNATURE Patsy S. Ashe		D3 TELEPHONE NUMBER (Include Area Code) 919-549-4270	
	D4 DATE SIGNED (YYMMDD) 01 DEC 1995					

Award

Mod 2

U. S. ARMY RESEARCH OFFICE
4300 SOUTH MIAMI BLVD.
P. O. BOX 12211
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709-2211

RESEARCH GRANT MODIFICATION

1. ARO PROPOSAL NUMBER: 32850-MA
2. GRANT NUMBER: DAAH04-94-G-0267
3. MODIFICATION NUMBER: P00002
4. GRANTEE NAME AND ADDRESS: George Mason University
4400 University Drive
Fairfax, Virginia 22030-4444
5. PRINCIPAL INVESTIGATOR(S): Dr. Edward J. Wegman
6. GRANTEE REQUEST FOR MODIFICATION (IF APPLICABLE): N/A
7. DESCRIPTION OF MODIFICATION:

A. In accordance with Article 12 of the Grant Schedule entitled OPTIONS FOR ADDITIONAL PERIODS OF RESEARCH, Article 8 of the Grant Schedule is increased as follows:

	Award Amount	Funded Amount
Previous Amount	\$ 95,000	\$ 95,000
Amount of Increase	80,000	80,000
Revised Amount	\$175,000	\$175,000

B. The performance period of the grant as specified in Article 8 of the Grant Schedule is changed as follows:

FROM: 15 July 1994 - 14 November 1995

TO: 15 July 1994 - 14 November 1996

C. Article 9 entitled APPROPRIATION DATA is modified to include the following:

2162040 66A-7270 P611102.H5705-2583 S31124 \$80,000
6H5705/6MA32850/6AROX94XGX0267

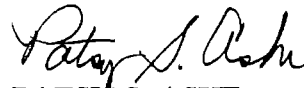
D. Grant payments for the amount of the increase shall be made in accordance with the following schedule of payments:

Payment No.	Payment Date	Payment Amount
1	1 December 1995	\$20,000
2	1 March 1996	\$20,000
3	1 June 1996	\$20,000
4	1 September 1996	\$18,000
5	Upon receipt of final technical report	\$ 2,000

The grantee shall advise the grant officer if at any time an adjustment to the above payment schedule is required due to a variance between projected and experienced expenditures.

All other provisions remain unchanged.

UNITED STATES OF AMERICA
U. S. Army Research Office



PATSY S. ASHE
Grants Officer

Date: 01 DEC 1995

Pre-Award

Mod 3



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211

NOV 22 1995



AMXRO-AAA

Subject: Proposal No. P-32850-MA, Modification P00003
to Grant No. DAAH04-94-G-0267

George Mason University
Sponsored Program Administration
ATTN: Ms Margaret Hanson
4400 University Drive
Fairfax, Virginia 22030

CONCURRENCE			
BRANCH CHIEF			
CLOSING CLK	MS		
AUTHOR	MS	25 Sep	
TYPIST			

Dear Ms Hanson:

Enclosed for your retention is a copy of the subject
modification.

Sincerely,

PSA

Patsy S. Ashe
Grants Officer

Enclosure

Copy Furnished:

ONR



AMXRO-AAA (P-32850-MA)

27 SEP 1996

MEMORANDUM FOR AMXRO-LO

SUBJECT: Modification No. P00003 to Agreement No. DAAH04-94-G-0267
with George Mason University

Subject funding action is submitted for your review. Request that
this proposed award be reviewed for legal sufficiency.



MARY N. JACKSON

AMXRO-LO 1st End

FOR AMXRO-AAA

The proposed funding action has been reviewed and is determined to be
legally sufficient.



MARK H. RUTTER
Attorney/Advisor
Date: 9/30/96

PURCHASE REQUEST AND COMMITMENT For use of this form, see AR 37-1; the proponent agency is OASA(FM)			1. Purchase Instrument No. 97-29		2. Requisition No.		3. Date September 9, 1996		PAGE 1 of 1	
4. TO: Purchasing & Contracting Officer			5. THRU: Resource Management Office			6. FROM: Math & Computer Sciences Div.				
It is requested that the supplies and services enumerated below or on attached list be										
7. Purchased For Mathematical & Computer Sciences Division				8. Delivered To				9. Not Later Than (Date)		
The supplies and services listed below cannot be secured through normal supply channels or other Army supply sources in the immediate vicinity, and their procurement will not violate existing regulations pertaining to local purchases for stock, therefore, local procurement is necessary for the following reason: (Check appropriate box and complete item).							10. NAME OF PERSON TO CALL FOR ADDITIONAL INFORMATION		11. TELEPHONE NO.	
12. LOCAL PURCHASES AUTHORIZED AS THE NORMAL MEANS OF SUPPLY FOR THE FORGOING BY			13. REQUISITIONING DISCLOSES NONAVAILABILITY OF ITEMS AND LOCAL PURCHASE IS AUTHORIZED BY			FUND CERTIFICATION <small>The supplies and services listed on this request are properly chargeable to the following allotments, the available balances of which are sufficient to cover the cost thereof, and funds have been committed</small>				
EMERGENCY SITUATION PRECLUDES USE OF REQUISITION CHANNELS FOR SECURING ITEM										
14. Item	15. DESCRIPTION OF SUPPLY OR SERVICES			16. QUANTITY	17. Unit	18. ESTIMATED		19. ACCOUNTING CLASSIFICATION AND AMOUNT		
						UNIT PRICE <i>a</i>	TOTAL COST <i>b</i>			
1	RESEARCH CONTRACT PROPOSAL NO. 32850-MA (Wegman) George Mason University Request funding of option on Contract No. DAAH04-94-G-0267 for research to be conducted for the period 15 November 1996 through 14 July 1997. Funding to be: \$65,000 FY97 Math funds. R&D Project NO. & Title: 1L161102-BH57-05 MA						\$65,000	2172040 76A-7270 P611102.H5705-2583 S31124 7X05MA/7MA32850/DAAH0494G0267 \$ 65,000 SUBJECT TO AVAILABILITY		
						20. TYPED NAME AND TITLE OF CERTIFYING OFFICER Susan Linens, RM		21. SIGNATURE <i>Susan Linens</i>		22. DATE 9/21/96
						23. DISCOUNT TERMS <i>FY96-PS</i>				
						24. PURCHASE ORDER NUMBER				
25. THE FOREGOING ITEMS ARE REQUIRED NOT LATER THAN AS INDICATED ABOVE FOR THE FOLLOWING PURPOSE								26. DELIVERY REQUIREMENTS ARE MORE THAN 7 DAYS REQUIRED TO INSPECT AND ACCEPT THE REQUESTED GOODS OR SERVICES: YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES, NUMBER OF DAYS REQUIRED		
27. TYPED NAME AND GRADE OF INITIATING OFFICER JAGDISH CHANDRA, SES-4			28. SIGNATURE <i>Jagdish Chandra</i>			29. DATE September 9, 1996		34. TYPED NAME AND GRADE OF APPROVING OFFICER OR DESIGNEE		35. SIGNATURE
30. TELEPHONE NO. x4254										36. DATE
31. TYPED NAME AND GRADE OF SUPPLY OFFICER			32 SIGNATURE			33. DATE				

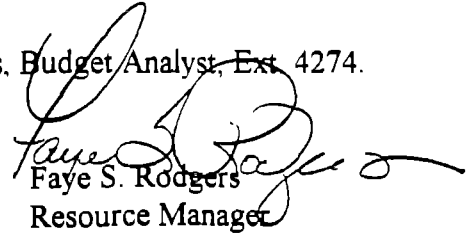
AMXRO-RM

22 November 1996

MEMORANDUM FOR AMXRO-AAA, Patsy Ashe

SUBJECT: Release of "Subject to Availability" Status

1. Attached is a listing of proposals that are released from "Subject to Availability" status and can now be awarded. The total amount for release is \$ 4,713,882.00.
2. Questions regarding this action may be directed to Susan Linens, Budget Analyst, Ext. 4274.


Faye S. Rodgers
Resource Manager

DTR> print pro-nu, findamt, prfppe of current sorted by prfppe, findamt

PRO NU	FNDAMT	PRFPRE
33809MA	\$34,000	30-Sep-1996
30707EG	\$50,368	30-Sep-1996
32146MS	\$55,000	30-Sep-1996
34934EG	\$55,571	30-Sep-1996
34768GS	\$68,000	30-Sep-1996
32945MA	\$50,000	14-Oct-1996
31387GS	\$23,528	31-Oct-1996
32846MA	\$35,000	31-Oct-1996
34816GS	\$55,000	31-Oct-1996
33174MS	\$80,000	31-Oct-1996
34564MS	\$75,000	9-Nov-1996
33035EL-JSE	\$1,281,960	9-Nov-1996
34536MS	\$84,000	10-Nov-1996
32168CH	\$25,000	14-Nov-1996
32174EG	\$41,124	14-Nov-1996
✓ 32850MA	\$65,000	14-Nov-1996
32535EG	\$80,000	14-Nov-1996
33605PH	\$90,000	14-Nov-1996
34450MS	\$91,415	14-Nov-1996
33159MA	\$165,000	19-Nov-1996
33134MS	\$90,000	21-Nov-1996
✓ 36219MS	\$68,699	22-Nov-1996
34099MS	\$110,000	24-Nov-1996
32545CH	\$14,548	30-Nov-1996
✓ 33043LS	\$22,650	30-Nov-1996
✓ 32320MA	\$25,000	30-Nov-1996
32508CH	\$25,000	30-Nov-1996
32362MS	\$44,996	30-Nov-1996
32922MA	\$45,000	30-Nov-1996
31403EG	\$50,000	30-Nov-1996
30782EG	\$57,775	30-Nov-1996
33931MA	\$60,000	30-Nov-1996
34040MS	\$61,688	30-Nov-1996
✓ 31597MS	\$65,029	30-Nov-1996
35354PH	\$70,000	30-Nov-1996
✓ 32823MS	\$72,651	30-Nov-1996
35661EG	\$73,165	30-Nov-1996
33659MS	\$74,619	30-Nov-1996
33144EG	\$75,000	30-Nov-1996
33137MS	\$75,000	30-Nov-1996
34685LS	\$80,000	30-Nov-1996
33497CH	\$80,000	30-Nov-1996
33896EG	\$80,000	30-Nov-1996
34699MA	\$80,000	30-Nov-1996
34589LS	\$85,374	30-Nov-1996
33529MA	\$90,000	30-Nov-1996
30330MS	\$99,972	30-Nov-1996
✓ 34553EL	\$99,987	30-Nov-1996
✓ 33031EG	\$100,000	30-Nov-1996
35783EL	\$100,000	30-Nov-1996
32969PH	\$114,000	30-Nov-1996
35010EL-JSE	\$525,230	30-Nov-1996
32984MS	\$60,000	2-Dec-1996
33688LS	\$63,700	2-Dec-1996
34918PH	\$80,000	6-Dec-1996
33652PH	\$273,756	8-Dec-1996
34601PH	\$22,200	14-Dec-1996

INDIVIDUAL GRANT ACTION REPORT

INTERAGENCY REPORT
CONTROL NUMBER
0252-DOC-QU

PART A		A1. TYPE OF REPORT 0 Original 1 Cancelling 2 Correcting 0		A2. REPORT NO.		A3. CONTRACTING OFFICE CODE AH04 AG55	
PART B		B1. DUNS NUMBER	B2. CAGE CODE	B3. INSTITUTION CODE	B4. TIN	B5. PARENT TIN	
B6. GRANTEE NAME AND DIVISION NAME George Mason University				B7. GRANTEE ADDRESS (Street, City, State) 4400 University Drive Fairfax, VA		B8. GRANTEE CITY OR PLACE CODE 26496	B9. GRANTEE STATE OR COUNTRY CODE 51
						B10. ZIP CODE 22030-4444	
B11. TYPE OF GRANTEE 1 State Government 2 County Government 3 Municipal Government 4 Special District Government 5 Independent School District 6 State Controlled Institutions of Higher Education 7 Indian Tribe 8 Nonprofit Agency (Other than Educational) 9 Private Higher Education Institution 10 Individual 11 Profit Organization (Not a Small Business) 12 Small Business 13 All Other 9				B12. OTHER GRANTEE INFORMATION 1 Historically Black Colleges and Universities 2 Minority Institution 3 Foreign University 4 Foreign Nonprofit Organization 5 Federally Funded Research and Development Center (Academic) 6 Federally Funded Research and Development Center (Nonprofit) 7 Not Applicable 7			
PART C		C1. GRANT NUMBER 94-G-0267	C2. MOD NUMBER P00003	C3. OBLIGATION DATE (YYMMDD)	C4. PROJECT STARTING DATE (YYMMDD)	C5. PROJECT ENDING DATE (YYMMDD)	
C6. TYPE OF ACTION 1 New Grant Award 2 Subsequent Incremental Funding Action 3 Extension of Option, Additional Research 4 Funding Adjustment to Completed Project 3		C7A. FEDERAL OBLIGATION AMOUNT (Enter whole dollars only) 65,000		C7B. FEDERAL OBLIGATION SIGN 1 Obligation 2 Deobligation 1		C8. TOTAL FEDERAL VALUE OF GRANT (Enter whole dollars only)	
		C9A. NONFEDERAL OBLIGATION AMOUNT (Enter whole dollars only)		C9B. NONFEDERAL OBLIGATION SIGN 1 Obligation 2 Deobligation			
C10. TYPE OF AWARD 1 Revenue Sharing 2 Block Grant 3 Formula Grant 4 Project Grant 5 Cooperative Agreement 6 Direct Payment (Specific Use) 7 Direct Loan 8 Guaranteed Loan 9 Insurance 10 Direct Payment (Restricted Use) 11 Other Reimbursable Contingent Intangible Indirect 4						C11. CFDA NUMBER 12.431	
C12. PROJECT DESCRIPTION VISUALIZATION METHODS FOR THE EXPLORATION OF HIGH DIMENSIONAL DATA							
C13. PRIMARY ADMINISTERING AGENCY 2100		C14. PRINCIPAL PLACE OF PERFORMANCE C14A. CITY OR PLACE CODE C14B. STATE OR COUNTRY CODE		C15. TYPE OF FUNDS 1 Research 2 Exploratory Development 3 Advanced Development 4 Engineering Development 5 Operational Systems Development 6 Management and Support 7 Other 1			
C16. AGENCY APPROPRIATION 1 ARMY 2 DNA 3 SOAO 4 OSD 5 DARPA 6 AF 7 NSA 8 DNA 9 DCA 10 DIA 11 USMC 12 NAVY 13 DIA 14 USNS 15 Non-DOO		C17. EXTENT COMPETED 1 Completed Action 2 Not Available for Consideration 3 Follow-on to Completed Action 4 Not Completed 1					
C18. CATEGORY OF SUPPORT (Choose one category)				AMOUNT 65,000		C19. CATEGORY OF SCIENCE AND ENGINEERING	
C18A. RESEARCH AND DEVELOPMENT						C19A. 21	
C18B. FELLOWSHIPS, TRAINEESHIPS						C19B.	
C18C. R & D PLANT						C19C.	
C18D. FACILITIES AND EQUIPMENT FOR SCIENCE AND ENGINEERING (DoD Institution)						C19D.	
C18E. GENERAL SUPPORT FOR SCIENCE AND ENGINEERING						C19E.	
C18F. OTHER ACTIVITIES RELATED TO SCIENCE AND ENGINEERING (Conference/Symposium)							
C18G. ALL OTHER ACTIVITIES NOT RELATED TO SCIENCE AND ENGINEERING							
PART D		D1. NAME OF CONTRACTING OFFICER OR REPRESENTATIVE (Last, First, Middle Initial) ASHE, PATSY S.		D2. SIGNATURE Patsy S. Ashe		D3. TELEPHONE NUMBER (Include Area Code) 919-549-4270	D4. DATE SIGNED (YYMMDD) 22 NOV 1996

Award Mod 3

U.S. ARMY RESEARCH OFFICE
4300 SOUTH MIAMI BLVD.
P. O. BOX 12211
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709-2211

RESEARCH GRANT SCHEDULE

1. ARO PROPOSAL NUMBER: P-32850-MA
2. GRANT NUMBER: DAAH04-94-G-0267
3. MODIFICATION NUMBER: P00003
4. GRANTEE NAME AND ADDRESS: George Mason University
4400 University Drive
Fairfax, Virginia 22030
5. PRINCIPAL INVESTIGATOR(S): Dr. Edward J. Wegman
6. GRANTEE REQUEST FOR MODIFICATION (IF APPLICABLE): N/A
7. DESCRIPTION OF MODIFICATION:

A. In accordance with Article 12 of the Grant Schedule entitled OPTIONS FOR ADDITIONAL PERIODS OF RESEARCH, Article 8 of the Grant Schedule is increased as follows:

	<u>Award Amount</u>	<u>Funded Amount</u>
Previous Amount	\$175,000	\$175,000
Amount of Increase	<u>65,000</u>	<u>65,000</u>
Revised Amount	\$240,000	\$240,000

B. The performance period of the grant as specified in Article 7 of the Grant Schedule is changed as follows:

FROM: 15 July 1994 - 14 November 1996

TO: 15 July 1994 - 14 July 1997

C. Article 9 entitled APPROPRIATION DATA is modified to include the following:

2172040 76A-7270 P611102.H5705-2583 S31124
7X05MA/7MA32850/DAAH0494G0267 \$65,000

Pre-Award

Mod 4



DEPARTMENT OF THE ARMY
ARMY RESEARCH OFFICE
P.O. BOX 12211
RESEARCH TRIANGLE PARK, NC 27709-2211

REPLY TO
ATTENTION OF

25 June 1997

AMXRO-AAA

Subject: Proposal No. 32850-MA, Modification P00004
to Grant No. DAAH04-94-G-0267

George Mason University
Office of Sponsored Programs
Attn: Mr. Bing Young
4400 University Drive
Fairfax, Virginia 22030-4444

CONCURRENCE			
BRANCH CHIEF			
CLOSING CLK			
AUTHOR	<i>DLc</i>	<i>25 Jun</i>	
TYPIST	<i>[Signature]</i>	<i>25 Jun</i>	

Dear Mr. Young:

Enclosed for your retention is a signed copy of the subject modification.

Sincerely,

PSA

Patsy S. Ashe
Grants Officer

Enclosure

Copy Furnished:

ONR

16 JUN 1997
32852-mA

George Mason University

Fairfax, Virginia 22030-4444

(703) 993-1000

June 12, 1997

Attn: Patsy S. Ashe
U.S. Army Research office (ARO)
4300 South Miami Blvd.
P.O. Box 12211
Research Triangle Park, North Carolina 27709-2211

Re: Grant No. DAAH04-94-G-0267

Subject: Request for a no-cost extension

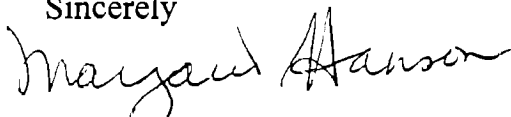
Dear Ms. Ashe:

George Mason University (GMU) requests a no-cost extension for the above cited project to October 1, 1997 with no additional funds.

Dr. Edward J. Wegman, the PI of this project, has agreed to host the third annual U.S. Army Conference on Applied Statistics to be held in George Mason University from October 20 to October 24, 1997. As part of this event, Dr. Wegman and Dr. Dan Carr are teaching a short course, Virtual Reality and Scientific Visualization, based in large part on the research we have carried out under the ARO project. We have been asked by the sponsor to incorporate into the short course data analysis of several Army data sets using our techniques. The no-cost extension will give us funded time in order to complete these analyses. The Army Research Office will be featuring our work in their annual review and have given us strong indication that they intend to continue funding of our work in the next fiscal year. This no-cost extension will also allow continuity in our efforts.

Please contact Bing Young, Office of Sponsored Programs, at 703/993-2982 by phone or 703/993-2296 by fax if you need additional Information.

Sincerely



Margaret Hanson, Proposal Manager
Office of Sponsored Programs

15 Jul 94 - 14 Jul 97

AMXRO-AAA P 32850-MA

24 JUN REC'D

MEMORANDUM FOR AMXRO- MA

SUBJECT: Grantee/Contractor GEORGE MASON UNIVERSITY
Grant No./Contract DAAH04-94-C-0267

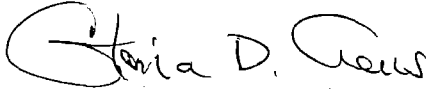
The attached request is submitted for your review and recommendations.

(X) No-cost extension through 1 OCT 1997
(Presently: 15 JUL 94 - 14 JUL 97)

() Rebudgeting _____

() Other (specify): _____

Encl


GLORIA D. CREWS
Contract Specialist

6/19/97

AMXRO-_____ 1st End

FOR AMXRO-AAA


Approval of the above request is:

(✓) recommended.

() not recommended.

COMMENTS:

Encl
nc


Technical Monitor
Date 22 June 1997

16 JUN 1997
32850-mA

George Mason University

Fairfax, Virginia 22030-4444
(703) 993-1000

June 12, 1997

Attn: Patsy S. Ashe
U.S. Army Research office (ARO)
4300 South Miami Blvd.
P.O. Box 12211
Research Triangle Park, North Carolina 27709-2211

Re: Grant No. DAAH04-94-G-0267

Subject: Request for a no-cost extension

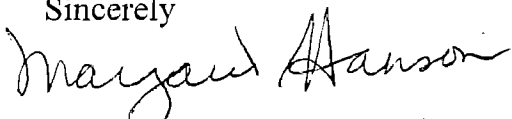
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Please contact Bing Young, Office of Sponsored Programs, at 703/993-2982 by phone or 703/993-2296 by fax if you need additional Information.

Sincerely



Margaret Hanson, Proposal Manager
Office of Sponsored Programs

15 Jul 94 - 14 Jul 97

Award Mod 4

✓

U.S. ARMY RESEARCH OFFICE
4300 SOUTH MIAMI BLVD.
P. O. BOX 12211
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709-2211

RESEARCH GRANT SCHEDULE - MODIFICATION

1. ARO PROPOSAL NUMBER: P-32850-MA
 2. GRANT NUMBER: DAAH04-94-G-0267
 3. MODIFICATION NUMBER: P00004
 4. GRANTEE NAME AND ADDRESS: George Mason University
Office of Sponsored Programs
4400 University Drive
Fairfax, Virginia 22030-4444
 5. PRINCIPAL INVESTIGATOR(S): Dr. Edward J. Wegman
 6. GRANTEE REQUEST FOR MODIFICATION: Letter of 12 June 1997
 7. DESCRIPTION OF MODIFICATION:
 - A. Article 7 of the Grant Schedule entitled **PERFORMANCE PERIOD**, is changed to extend the performance period as follows:

FROM: 15 July 1994 - 14 July 1997
TO: 15 July 1994 - 1 October 1997
 - B. Article 9 entitled **APPROPRIATION DATA** remains the same:
2172040 76A-7270 P611102.H5705-2583 S31124 \$0
7X05MA/7MA32850/DAAH0494G0267
 - C. Total grant cost shall neither increase nor decrease as a result of this approval.
- All other provisions remain unchanged.

UNITED STATES OF AMERICA
U.S. Army Research Office



PATSY S. ASHE
Grants Officer
Date: 25 JUN 1997