

Final Progress Report for Research Projects Funded by Health Research Grants

Instructions: Please complete all of the items as instructed. Do not delete instructions. Do not leave any items blank; responses must be provided for all items. If your response to an item is “None”, please specify “None” as your response. “Not applicable” is not an acceptable response for any of the items. There is no limit to the length of your response to any question. Responses should be single-spaced, no smaller than 12-point type. The report **must be completed using MS Word**. Submitted reports must be Word documents; they should not be converted to pdf format.

1. **Grantee Institution: The Pennsylvania State University**
2. **Reporting Period (start and end date of grant award period): 12/12/2012 - 12/31/2013**
3. **Grant Contact Person (First Name, M.I., Last Name, Degrees): John Anthony, MPA**
4. **Grant Contact Person’s Telephone Number: 814 935 1081**
5. **Grant SAP Number:4100050904**
6. **Project Number and Title of Research Project: 49. Research Infrastructure: Penn State Center for Computational and Integrative Biomedical Research**
7. **Start and End Date of Research Project: 12//12/2012 - 12/31/2013**
8. **Name of Principal Investigator for the Research Project: Peter J. Hudson**
9. **Research Project Expenses.**

9(A) Please provide the total amount of health research grant funds spent on this project for the entire duration of the grant, including indirect costs and any interest earned that was spent:

\$ 1,700,002

9(B) Provide the last names (include first initial if multiple individuals with the same last name are listed) of **all** persons who worked on this research project and were supported with health research funds. Include position titles (Principal Investigator, Graduate Assistant, Post-doctoral Fellow, etc.), percent of effort on project and total health research funds expended for the position. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name, First Name	Position Title	Institution	% of Effort on Project	Cost
None				

9(C) Provide the names of **all** persons who worked on this research project, but who *were not* supported with health research funds. Include position titles (Research Assistant, Administrative Assistant, etc.) and percent of effort on project. For multiple year projects, if percent of effort varied from year to year, report in the % of Effort column the effort by year 1, 2, 3, etc. of the project (x% Yr 1; z% Yr 2-3).

Last Name, First Name	Position Title	Institution	% of Effort on Project	Cost
Hudson, Peter	Director of	Huck Institutes of the Life Sciences	1%	1,819

9(D) Provide a list of **all** scientific equipment purchased as part of this research grant, a short description of the value (benefit) derived by the institution from this equipment, and the cost of the equipment.

Type of Scientific Equipment	Value Derived	Cost
Array Scanner	Generate data from wet lab for use on the visualization wall	\$55,500
ChemidDoc XRS	Generate data from wet lab for use on the visualization wall	\$21,364
Visualization Wall	To display bio-medical data and modeling	\$350,587
Tele-Presence Support	To connect video and audio capabilities to Hershey and other research institutes	\$93,500
Ideum Pano Table	To provide interact high resolution of data and modeling	\$37,583

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10. Co-funding of Research Project during Health Research Grant Award Period. Did this research project receive funding from any other source during the project period when it was supported by the health research grant?

Yes _____ No X _____

If yes, please indicate the source and amount of other funds:

11. Leveraging of Additional Funds

11(A) As a result of the health research funds provided for this research project, were you able to apply for and/or obtain funding from other sources to continue or expand the research?

Yes _____ No X _____

If yes, please list the applications submitted (column A), the funding agency (National Institutes of Health—NIH, or other source in column B), the month and year when the application was submitted (column C), and the amount of funds requested (column D). If you have received a notice that the grant will be funded, please indicate the amount of funds to be awarded (column E). If the grant was not funded, insert “not funded” in column E.

Do not include funding from your own institution or from CURE (tobacco settlement funds). Do not include grants submitted prior to the start date of the grant as shown in Question 2. If you list grants submitted within 1-6 months of the start date of this grant, add a statement below the table indicating how the data/results from this project were used to secure that grant.

A. Title of research project on grant application	B. Funding agency (check those that apply)	C. Month and Year Submitted	D. Amount of funds requested:	E. Amount of funds to be awarded:
	<input type="checkbox"/> NIH <input type="checkbox"/> Other federal (specify: _____) <input type="checkbox"/> Nonfederal source (specify: _____)		\$	\$
	<input type="checkbox"/> NIH <input type="checkbox"/> Other federal		\$	\$

	(specify: _____ _____) <input type="checkbox"/> Nonfederal source (specify: _____)			
	<input type="checkbox"/> NIH <input type="checkbox"/> Other federal (specify: _____ _____) <input type="checkbox"/> Nonfederal source (specify: _____)		\$	\$

11(B) Are you planning to apply for additional funding in the future to continue or expand the research?

Yes _____ No _____

If yes, please describe your plans:

12. Future of Research Project. What are the future plans for this research project?

The rapid increase in the production and use of large, complex, and diverse datasets has fundamentally transformed research in the life sciences. However, even while becoming data-rich and data-driven, the ability of researchers to locate, analyze, and use these data is limited due to a lack of access to relevant software, tools and expertise. The new Center of Excellence seeks to make Penn State the go to place for developing and providing access to tools and technologies that assist in the management, analysis and dissemination of biological data.

The Center will support faculty from the following Penn State Research Institutes:

- Huck Institutes of the Life Sciences (197 faculty)
- Social Science Research Institute (137 faculty)
- Material Research Institute (242 faculty)
- Penn State Institutes of Energy and the Environment (60 faculty)

As the Center develops, Huck Institutes will assign a permanent facilitator to oversee the operations and work with both Computational Scientists and Researchers to maximize its use and benefits.

13. New Investigator Training and Development. Did students participate in project supported internships or graduate or post-graduate training for at least one semester or one summer?

Yes _____ No X _____

If yes, how many students? Please specify in the tables below:

	Undergraduate	Masters	Pre-doc	Post-doc
Male				
Female				
Unknown				
Total				

	Undergraduate	Masters	Pre-doc	Post-doc
Hispanic				
Non-Hispanic				
Unknown				
Total				

	Undergraduate	Masters	Pre-doc	Post-doc
White				
Black				
Asian				
Other				
Unknown				
Total				

14. Recruitment of Out-of-State Researchers. Did you bring researchers into Pennsylvania to carry out this research project?

Yes _____ No X _____

If yes, please list the name and degree of each researcher and his/her previous affiliation:

15. Impact on Research Capacity and Quality. Did the health research project enhance the quality and/or capacity of research at your institution?

Yes X _____ No _____

If yes, describe how improvements in infrastructure, the addition of new investigators, and other resources have led to more and better research.

Data generation in the Life Sciences has been majorly impacted by the advances in techniques and instrumentation with resultant explosion of information described by the now popular term “big-data”. The digital nature of big-data has pulled computer science closer than ever to life sciences resulting in the said migration of war against diseases to the cyberspace. By combining a robust infrastructure, with correct tools for analysis, the ability to accelerate the development of research will help win this fight and accelerate the advancement of cures.

Up until now, biomedical researchers have been working independent of highly trained computational scientist. Penn State’s Galaxy program allows biomedical researchers to upload data and information into complex algorithmic model and returns results with little interaction with computational scientist. The Center of Excellence now provides a location and platform for researchers to work directly with computational scientists using programs like Galaxy on a one on one basis to share data, analyze results and deliver alternative hypothesis and answers. Through the use of the space and visualization technology, researchers now have the ability to share visualized results, modify three dimensional models, and overlay variants to create a dynamic environment of shared information.

The new Center of Excellence provides added capacity through the addition of working spaces, conference rooms and a visualization areas allowing for a higher quality of exchange of information through the use of innovative tools and technology. The Center becomes the seed to attract high quality cyber engineers, biomedical scholars and students to enhance the pool of researchers in the pursuit of advancing science. As a result, the Center becomes a showcase that will proliferate throughout other areas of the University to attract world renowned scientists.

16. Collaboration, business and community involvement.

16(A) Did the health research funds lead to collaboration with research partners outside of your institution (e.g., entire university, entire hospital system)?

Yes No

If yes, please describe the collaborations:

The Center is designed to create an environment that fosters collaboration in themed areas of research, both within the University and globally. With the addition of the Tele-presence room adjacent to the visualization area, researchers in Hershey and other academic institutions can participate remotely allowing for world-wide collaboration between Penn State scientists and investigators located throughout the globe. The goal is to facilitate inter-disciplinary research in real time allowing researchers the ability to interact more closely without the barriers of distance.

16(B) Did the research project result in commercial development of any research products?

Yes No

If yes, please describe commercial development activities that resulted from the research project:

16(C) Did the research lead to new involvement with the community?

Yes _____ No X

If yes, please describe involvement with community groups that resulted from the research project:

17. Progress in Achieving Research Goals, Objectives and Aims.

List the project goals, objectives and specific aims (as contained in the grant agreement). Summarize the progress made in achieving these goals, objectives and aims for the period that the project was funded (i.e., from project start date through end date). Indicate whether or not each goal/objective/aim was achieved; if something was not achieved, note the reasons why. Describe the methods used. If changes were made to the research goals/objectives/aims, methods, design or timeline since the original grant application was submitted, please describe the changes. Provide detailed results of the project. Include evidence of the data that was generated and analyzed, and provide tables, graphs, and figures of the data. List published abstracts, poster presentations and scientific meeting presentations at the end of the summary of progress; peer-reviewed publications should be listed under item 20.

This response should be a DETAILED report of the methods and findings. It is not sufficient to state that the work was completed. Insufficient information may result in an unfavorable performance review, which may jeopardize future funding. If research findings are pending publication you must still include enough detail for the expert peer reviewers to evaluate the progress during the course of the project.

Health research grants funded under the Tobacco Settlement Act will be evaluated via a performance review by an expert panel of researchers and clinicians who will assess project work using this Final Progress Report, all project Annual Reports and the project's strategic plan. After the final performance review of each project is complete, approximately 12-16 months after the end of the grant, this Final Progress Report, as well as the Final Performance Review Report containing the comments of the expert review panel, and the grantee's written response to the Final Performance Review Report, will be posted on the CURE Web site.

There is no limit to the length of your response. Responses must be single-spaced below, no smaller than 12-point type. If you cut and paste text from a publication, be sure symbols print properly, e.g., the Greek symbol for alpha (α) and beta (β) should not print as boxes (\square) and include the appropriate citation(s). DO NOT DELETE THESE INSTRUCTIONS.

The role of interdisciplinary research in enabling basic and translational health research is well established. The Millennium Sciences Complex on the University Park campus of Penn State is

a newly constructed facility (\$297 million, 295,000 sq. ft.) that promotes interdisciplinary research with broad impact at the interface of biomedical (life) and materials science.

The broad objective and overall goal of this project is to develop a Center for Excellence in Computational and Integrative Biomedical Research at Penn State. To accomplish this goal, an unfinished portion of the 3rd floor of the Millennium Sciences Complex (MSC) at the University Park campus of Penn State was developed to support interdisciplinary computational modeling and bioinformatics research. Activities in this center will be integrated with key biomedical research facilities at the Huck Institutes of the Life Sciences so as to enable the discovery of new knowledge and approaches to the diagnosis, prevention and treatment of diseases. Together, we believe that our activities will not only positively impact health related research through biomedical resource and capacity building, but also anticipate that this program will embrace new approaches in social sciences and lead to the translation of basic scientific research to directly improve patient health.

Specific Aim 1. To develop current, open and unfinished space on the 3rd floor of MSC into high quality collaborative workspace that will house computational scientists and scholars engaged in interdisciplinary research that applies information sciences, material & bioengineering research to address biomedical issues.

The Center for Excellence in Computational and Integrative Biomedical Research at Penn State provides a facility with state of the art technology to support the research needs of combining biological research with computational science. The newly developed space includes 3 additional conference rooms, one permanent office, nine graduate and post graduate workstations along with a central visualization area to support large collaborative sessions between researchers and computational scientists. The new space includes; under-floor power and data-distribution (for easy servicing), workstations, energy-efficient air handling and lighting systems, a video conferencing area, an integrated 16-tile touch screen visualization wall, along with a 72 inch computational modelling display table. The facility will be able to house more than 20 research scientists, including bio-informaticians, cyber-scientists, postdoctoral fellows and graduate students. In addition, the area located between the North and West wing of MSC offers a secure location to support biomedical relevant research, especially in the areas of infectious diseases, genomics and bioinformatics, neurosciences, imaging, and biomedical (neural) engineering.

This space is designed to create an environment that fosters collaboration in themed areas of research. By including other Penn State Institutes, research can be expanded to include “big-data” and information from bio-medical studies to the impact on social, environmental and material research. Multiple data sets can now be shared simultaneously allowing for translational studies, embracing the individual variations, interactions and identifying personalized solutions.

The additional 2,800 square feet of work related space delivers state of the art technology to support large scale visualization of computational “big-data” and imaging. The space allows multiple users to connect simultaneously through a single system to display data. The added technological feature gives researchers the opportunity to share massive amounts of data, overlapping results through one centralized mechanism. With the support of touch screen

technology, users are able to easily move data around the screens and overlay new screens by simply touching the wall. This advancement in technology allows large quantities of data to be compared and analyzed by multiple Principal Investigators in one central location. The space also serves as a training location for investigators to explain large data set variants to students and visitors, by closely interacting with the visualization wall.

In addition to the visualization wall, the Center houses an Ideum Pano touch table. Ideum touch table is an integrated 100" multi-touch table with dual 55" 4k Ultra HD displays and a continuous touch surface that supports over 40 touch points. The table display and applications are supported by a high-performance graphics workstation. The paired 55" ultra HD displays offer display resolution of 7680 pixels wide by 2160 pixels tall (8.3 megapixels), allowing display of finely detailed images that often are required for dense data visualization applications. The table allows touch-enabled interactive control of the desktop, supported applications, and data displays so that users can directly, intuitively and simultaneously work with multi-model application workspaces and data representations of various types. The collective feature of the Pano table provides a rich venue for natural display management and collaborative data exploration by researchers, with the goal of facilitating more immediate and intuitive understanding of data being studied.

With the addition of the Tele-presence room adjacent to the visualization area, researchers in Hershey and other academic institutions to communicate through real-time interactions allowing for world-wide collaboration between Penn State scientists and investigators located throughout the globe. The goal is to bring research scientists closer together without the barriers of distance.

The newly created space offers critical infrastructure and the support of key shared resources that are needed to catalyze the discovery of new knowledge and the development of novel methods to detect, prevent and treat disease. The previous unfinished space on the 3rd floor of MSC has now been transformed into high quality collaborative workspaces that will house computational scientists and scholars engaged in interdisciplinary research in biomedical, life, materials, bioengineering and information sciences.

The new Center for Excellence has been put in place to perform "big-data" analytics at its finest. In the interdisciplinary setting of MSC, the aim is to facilitate sifting through information from various projects and layering data sets to expand the scope of current research. The strategy, however, would be incomplete without vigorous wet-bench research to both generate raw data as well as validate hypothesis generated in-silico. Additional research instruments purchased and included in this project to assist researchers in creating analytical data include the Spectrophotometer and Biorad Chemidoc XRS system.

The Spectrophotometer and Biorad Chemidoc XRS system will be shared by Faculty belonging to the Center for Infectious disease dynamics (CIDD), Center for Molecular Immunology of Infectious Diseases (CMIID) and Center for Neuro Engineering (CNE) for research and analysis. These groups will use both instruments for generating data specific to diseases their research is focused on, such as herpes, malaria, and whooping cough. The Chemidoc XRS system will be used in the process of generating genomic data such as SNPs between different

sets of pathogenic strains and in preparative aspects of genome sequencing. The Spectrophotometer will be used to generate additional “omics” data via high-throughput enzymatic/ELISA type analysis. Further, these instruments will be used for testing the hypothesis generated by in-silico analysis of the big-data.

MSC facilities include both purpose-built (specialized) and general laboratory space as well as common areas that are designed to encourage discussion and the sharing of physical and intellectual resources in the life and materials sciences. We now seek to use this unique opportunity to help realize the full potential of this interdisciplinary approach to advancing biomedical and health research by utilizing the Center for Excellence in computational and integrative biomedical research. The Center provides workspace for computational scientists and students that work at the disciplinary boundaries of health, life, and materials sciences research, to conduct of biomedical relevant research, particularly in the areas of infectious diseases, genomics and bioinformatics, neurosciences, metabolomics, imaging, and biomedical (neural) engineering in MSC and at Penn State.

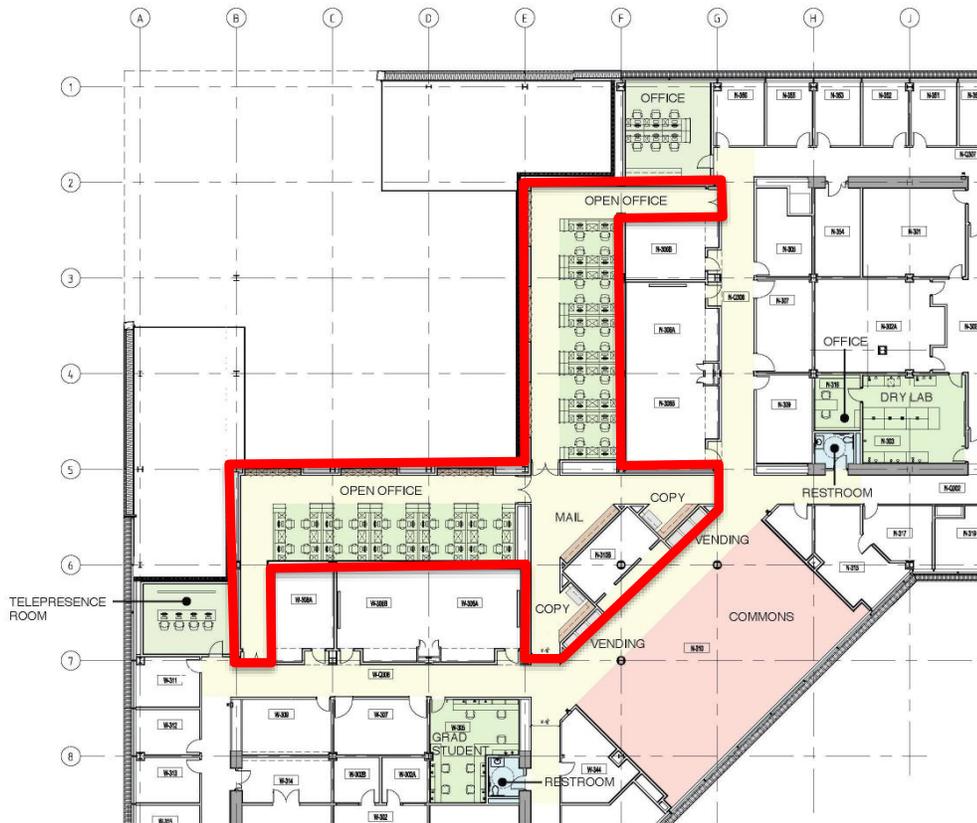
Currently, there are several researchers that are using the Center for Excellence along with the new instrumentation to facilitate research and education. Dr. Moriah Szpara, who studies virus DNA and investigates the staggering complexity of the herpes simplex genome is using the large-scale representations are an important step in training students to notice the comparisons, variations and gaps in genetic sequencing through the variations and subtleties in enormous number sets.

Dr. Matt Ferrari, an assistant professor of biology, who is working to prevent the spread of Measles in children around the globe, will begin using the visualization wall this month to eliminate the back and forth process of sharing data among researchers. Instead, Dr. Ferrari and a team of researchers will utilize the new Center as a location to meet and share data in real time, allowing them to look at different variables simultaneously in order to predict and prevent outbreaks.

Dr. Marylyn Ritchie, the Director of the Center for System Genomics, has begun to use the Center of Excellence to enhance the progress of the ATHENA project (Analysis Tool for Heritable and Environmental Network Associations). ATHENA is a solution for the dissection of genetic architecture in common, complex disease. ATHENA will provide a mechanism to 1) perform variable selection from categorical and continuous independent variables, 2) model single factor and/or interaction effects to predict continuous or categorical outcomes, and 3) interpret or annotate the significant statistical models for use in biomedical research.

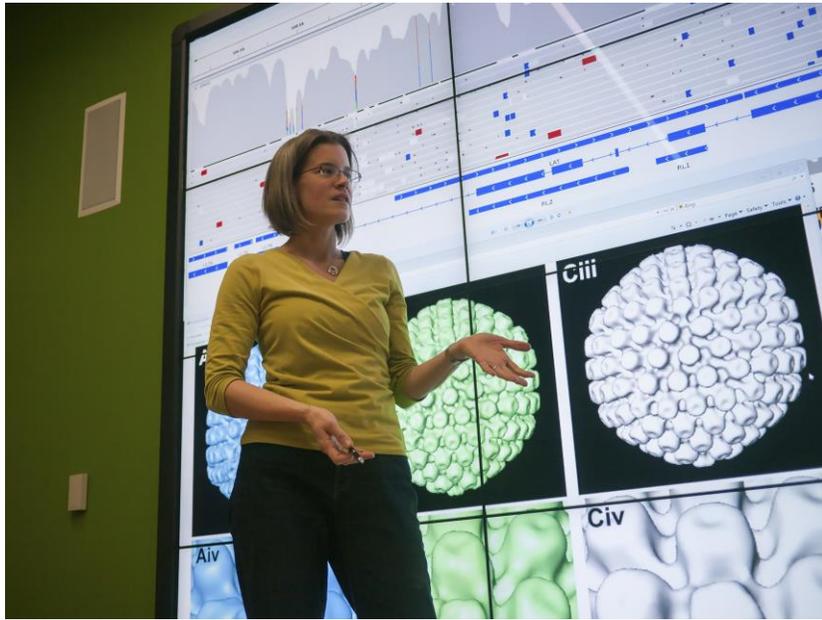
The promotion of the Center’s technology and capabilities to key researchers is key to the success of the Center. With the Center being completed at the end of December, faculties are now beginning to take advantage of the technological capabilities. Workshops and seminars are being planned for this summer and fall semester as a key location to for researchers to showcase their work and findings. The space will also serve as a training ground for students and post-doctoral fellows to hone skills and techniques beyond previous capabilities. The addition of the Center for Excellence meets the specific aim of developing an interactive space within the

confines of MSC that offers advanced visual technology that can promote and engage interdisciplinary research among researchers, computational scientists, and students. The following pages illustrate the finished space along with fellow researchers using the space.



PENN STATE UNIVERSITY MILLENNIUM SCIENCE COMPLEX - 3RD FLOOR REVISIONS

THIRD FLOOR PLAN









18. Extent of Clinical Activities Initiated and Completed. Items 18(A) and 18(B) should be completed for all research projects. If the project was restricted to secondary analysis of clinical data or data analysis of clinical research, then responses to 18(A) and 18(B) should be “No.”

18(A) Did you initiate a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

_____ Yes
_____ No

18(B) Did you complete a study that involved the testing of treatment, prevention or diagnostic procedures on human subjects?

_____ Yes
_____ No

If “Yes” to either 18(A) or 18(B), items 18(C) – (F) must also be completed. (Do NOT complete 18(C-F) if 18(A) and 18(B) are both “No.”)

18(C) How many hospital and health care professionals were involved in the research project?

_____ Number of hospital and health care professionals involved in the research project

18(D) How many subjects were included in the study compared to targeted goals?

_____ Number of subjects originally targeted to be included in the study

_____ Number of subjects enrolled in the study

Note: Studies that fall dramatically short on recruitment are encouraged to provide the details of their recruitment efforts in Item 17, Progress in Achieving Research Goals, Objectives and Aims. For example, the number of eligible subjects approached, the number that refused to participate and the reasons for refusal. Without this information it is difficult to discern whether eligibility criteria were too restrictive or the study simply did not appeal to subjects.

18(E) How many subjects were enrolled in the study by gender, ethnicity and race?

Gender:

_____ Males
_____ Females
_____ Unknown

Ethnicity:

_____ Latinos or Hispanics
_____ Not Latinos or Hispanics
_____ Unknown

Race:

_____ American Indian or Alaska Native
_____ Asian
_____ Blacks or African American
_____ Native Hawaiian or Other Pacific Islander
_____ White
_____ Other, specify: _____
_____ Unknown

18(F) Where was the research study conducted? (List the county where the research study was conducted. If the treatment, prevention and diagnostic tests were offered in more than one county, list all of the counties where the research study was conducted.)

19. Human Embryonic Stem Cell Research. Item 19(A) should be completed for all research projects. If the research project involved human embryonic stem cells, items 19(B) and 19(C) must also be completed.

19(A) Did this project involve, in any capacity, human embryonic stem cells?

_____ Yes
_____ No

19(B) Were these stem cell lines NIH-approved lines that were derived outside of Pennsylvania?

_____ Yes
 _____ No

19(C) Please describe how this project involved human embryonic stem cells:

20. Articles Submitted to Peer-Reviewed Publications.

20(A) Identify all publications that resulted from the research performed during the funding period and that have been submitted to peer-reviewed publications. Do not list journal abstracts or presentations at professional meetings; abstract and meeting presentations should be listed at the end of item 17. **Include only those publications that acknowledge the Pennsylvania Department of Health as a funding source** (as required in the grant agreement). List the title of the journal article, the authors, the name of the peer-reviewed publication, the month and year when it was submitted, and the status of publication (submitted for publication, accepted for publication or published.). Submit an electronic copy of each publication or paper submitted for publication, listed in the table, in a PDF version 5.0.5 (or greater) format, 1,200 dpi. Filenames for each publication should include the number of the research project, the last name of the PI, and an abbreviated title of the publication. For example, if you submit two publications for Smith (PI for Project 01), one publication for Zhang (PI for Project 03), and one publication for Bates (PI for Project 04), the filenames would be:

- Project 01 – Smith – Three cases of isolated
- Project 01 – Smith – Investigation of NEB1 deletions
- Project 03 – Zhang – Molecular profiling of aromatase
- Project 04 – Bates – Neonatal intensive care

If the publication is not available electronically, provide 5 paper copies of the publication.

Note: The grant agreement requires that recipients acknowledge the Pennsylvania Department of Health funding in all publications. Please ensure that all publications listed acknowledge the Department of Health funding. If a publication does not acknowledge the funding from the Commonwealth, do not list the publication.

Title of Journal Article:	Authors:	Name of Peer-reviewed Publication:	Month and Year Submitted:	Publication Status (check appropriate box below):
1.				<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input type="checkbox"/> Published
2.				<input type="checkbox"/> Submitted <input type="checkbox"/> Accepted <input type="checkbox"/> Published
				<input type="checkbox"/> Submitted

3.				<input type="checkbox"/> Accepted <input type="checkbox"/> Published
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20(B) Based on this project, are you planning to submit articles to peer-reviewed publications in the future?

Yes _____ No X

If yes, please describe your plans:

21. Changes in Outcome, Impact and Effectiveness Attributable to the Research Project.

Describe the outcome, impact, and effectiveness of the research project by summarizing its impact on the incidence of disease, death from disease, stage of disease at time of diagnosis, or other relevant measures of outcome, impact or effectiveness of the research project. If there were no changes, insert “None”; do not use “Not applicable.” Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

22. Major Discoveries, New Drugs, and New Approaches for Prevention Diagnosis and Treatment.

Describe major discoveries, new drugs, and new approaches for prevention, diagnosis and treatment that are attributable to the completed research project. If there were no major discoveries, drugs or approaches, insert “None”; do not use “Not applicable.” Responses must be single-spaced below, and no smaller than 12-point type. DO NOT DELETE THESE INSTRUCTIONS. There is no limit to the length of your response.

23. Inventions, Patents and Commercial Development Opportunities.

23(A) Were any inventions, which may be patentable or otherwise protectable under Title 35 of the United States Code, conceived or first actually reduced to practice in the performance of work under this health research grant? Yes _____ No X

If “Yes” to 23(A), complete items a – g below for each invention. (Do NOT complete items a - g if 23(A) is “No.”)

- a. Title of Invention:
- b. Name of Inventor(s):
- c. Technical Description of Invention (describe nature, purpose, operation and physical, chemical, biological or electrical characteristics of the invention):

- d. Was a patent filed for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?

Yes _____ No _____

If yes, indicate date patent was filed:

- e. Was a patent issued for the invention conceived or first actually reduced to practice in the performance of work under this health research grant?

Yes _____ No _____

If yes, indicate number of patent, title and date issued:

Patent number:

Title of patent:

Date issued:

- f. Were any licenses granted for the patent obtained as a result of work performed under this health research grant? Yes _____ No _____

If yes, how many licenses were granted? _____

- g. Were any commercial development activities taken to develop the invention into a commercial product or service for manufacture or sale? Yes _____ No _____

If yes, describe the commercial development activities:

23(B) Based on the results of this project, are you planning to file for any licenses or patents, or undertake any commercial development opportunities in the future?

Yes _____ No X _____

If yes, please describe your plans:

24. Key Investigator Qualifications. Briefly describe the education, research interests and experience and professional commitments of the Principal Investigator and all other key investigators. In place of narrative you may insert the NIH biosketch form here; however, please limit each biosketch to 1-2 pages. *For Nonformula grants only – include information for only those key investigators whose biosketches were not included in the original grant application.*

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Peter J Hudson	POSITION TITLE Willaman Professor of Biology, Director of the Huck Institutes of the Life Sciences		
eRA COMMONS USER NAME (credential, e.g., agency login) PETER_HUDSON			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Department of Zoology, University of Leeds. UK Magdalen College, Edward Grey Institute of Ornithology, Department of Zoology University of Oxford, UK	BSc (Hons) DPhil	1974 1979	Zoology Population ecology

A. Positions and Honors

Positions and Employment

1979-1995	Upland Research Manager, Game Conservancy Trust
1995-1998	Reader in Animal Ecology, University of Stirling UK
1998-2002	Personal chair in Animal Ecology: University of Stirling UK
2002-Present	Willaman Chair in Biology, Penn State University

2004-2006 Director Center for Infectious Disease Dynamics
2006-Present Director of Huck institutes of Life Sciences

Honors and Awards

1985 First winner of The Laurent Perrier Award for Game Conservation
1992 The Guardian Environmental Book of the Year (listed)
2004 Distinguished Ecologist, Colorado State University
2006 Carlton Herman Prize
2008 Elected Fellow of the Royal Society
2010 Elected Corresponding Fellow of the Royal Society of
Edinburgh
2011 NIMBioS (National Institute for Mathematical and Biological
Synthesis) Board Member 2011-2012 USFWS (United States Fish &
Wildlife Service) Advisory Board Chair
2013 Inducted as Elected Fellow of the AAAS
2013 Penn State Cape Town GEN Advisory Committee(GAC) board
member
2013 Appointed Scientific Advisor for the Howard Hughes Medical
Institute (HHMI)
2013 Chair of the Nelson Mandela African Institute for Science and
Technology (NMAIST)
Internal Advisory Board

B. Selected peer-reviewed publications (in chronological order)

Selected from more than 200 papers available at <http://www.cidid.psu.edu/people/pjh18>

1. Kerr, Peter J, Rogers, Matthew B.; Fitch, Adam ; DePasse, Jay V. Cattadori, Isabella M.; Twaddle, Alan C.; Hudson, Peter J. ; Tschärke, David C.; Read, Andrew F.; Holmes, Edward C. Genome Scale Evolution of Myxoma Virus Reveals Host-Pathogen Adaptation and Rapid Geographic Spread *Journal of Virology* Volume: 87: Issue: 23 : Pages: 12900-12915 DOI: 10.1128/JVI.02060-13 Published: Dec 2013
2. Cassirer, E.F., Plowright, R.K., Manlove, K.R., Cross, P.C., Dobson, A.P., Potter, K.A., Hudson, P.J.
Spatio-temporal dynamics of pneumonia in bighorn sheep. *J Anim Ecol.* Feb, 8 2013
Almberg, E.S., Cross, P., Dobson, A.P., Smith, D.W. & Hudson, P.J. 2012. Parasite invasion following host reintroductions: A case study of Yellowstone's wolves. *Phil Trans Roy Soc.* In press
3. Keesing, F., Belden, L., Daszak, P., Dobson, A., Harvell, C.D., Holt, R.D., Hudson, P et al. 2010 Impacts of biodiversity on the emergence and transmission of infectious diseases. *Nature* 476: 647-652

C. Research Support

Ongoing Research Support

DEB-1311409 Hudson (PI)
05/01/2013-04/30/2014

National Science Foundation

Dissertation Research: Natural and acquired immunity within Yellowstone's wolves: consequences for disease severity, survival, and reproduction

G12AC20331 Hudson (PI)
08/01/2012-07/31/2017

U.S. Geological Survey
Disease Impacts on Yellowstone Wolves

L11AC20382 Hudson (PI)
10/04/2011-09/30/2016

U.S. Department of the Interior
Desert Tortoise Disease Study

DEB-1216054 Hudson (PI)
09/01/2012-08/31/2017

National Science Foundation
EID: Collaborative Research: Invasion and Infection: Translocation and Transmission: An Experimental Study with Mycoplasma in Desert Tortoises

1R01 AI093804-02 Hudson (co-PI)
12/02/2011-11/30/2016

National Institute of Allergy and Infectious Disease
Genomic analysis of the cononical case of virulence evolution: myxomatosis in Australia

D13ZO-081 Hudson (PI)
07/01/2012-06/30/2015

Morris Animal Foundation
Developing an evidence base for managing bighorn sheep pneumonia: understanding the role of carriers

145412 Hudson (PI)
11/21/2012-06/01/2015

Griffiths University
Models to predict Hendra virus prevalence in fruit bat populations

Past Research Support

115989 Hudson (PI)
09/01/2009-09/01/2012

The Society for Conservation Biology
Climate Change, Wildlife Corridors and Health Consequences in the US Northern Rockies
(Fellowship for R. Plowright)

D10ZO-056 Hudson (PI)
09/01/2010-08/31/2012

Morris Animal Foundation
Connectivity, Isolation and Disease Dynamics: Trade-offs in Recovering Bighorn Sheep Populations

Grant 124287 Hudson (PI)
07/01/2010-06/30/2012

NIH Foggarty
NIH IPA Assignment

OCI-0821527

Hudson (Co-PI)

07/01/2008-07/30/2012

National Science Foundation

MRI: Acquisition of a Scalable Instrument for Discovery Through Computing