

## Independent Scientific Research Project: Your Prospectus

*Okey-dokey boys & girls! Time to get cracking on your big summer/fall/winter project. And the first step is to write a formal research proposal – or "prospectus" – outlining your intended study. This prospectus will weigh heavily in your semester average, equal to a big exam.*

One of the central educational missions of the CBGS program is to foster original, independent scientific research. Toward that end, we adopted this research sequence and schedule:

*Fall/Winter, Jr. Year:* Learn elements of scientific research and experimental design, including graphical and statistical analysis of data

*Spring, Jr. year:* Propose your own question(s) (perhaps related to marine or environmental science) and develop a plan for tackling that question using scientific method

*Summer/Fall, Sr. Year:* Conduct your actual lab and/or field work, collecting raw data

*Fall/Winter, Sr. Year:* Analyze and interpret your data, write a formal paper summarizing and discussing your research, and present your findings at the annual CBGS Science Symposium (also, solid projects may advance to the Virginia Junior Academy of Science competition)

### **Advices & Guidelines:**

- Pick a question and develop a project that will genuinely interest and motivate **YOU** ...something you'll really be curious about and enjoy unraveling ...something you'll be proud of. If you're the outdoors sort, go for something that will involve field research. If not, go for a laboratory setting. But above all, good science is driven by **authentic inquisitiveness**.
- Since Marine & Environmental Science is the theme of the Chesapeake Bay Governor's School, we hope that many of you will tackle a question and topic relevant to marine and/or environmental science. However, since your foremost goal should be to take on something that interests **YOU**, you may instead decide to do research in another area: physics, chemistry, engineering, general biology, psychology, even mathematics. The attached list of research ideas reflect my own leanings toward biology and aquatic science, but there are many, many other possibilities!
- Question & Theory FIRST, Experiment Second! Start with a **general question** and with **theory**. Theory just means *thinking in a scientific way* about scientific principles that might suggest an answer to your question. In choosing a topic, resist the urge to dive straight into the experiment and data collection end of things. That comes later. If you raise a good question and think about it theoretically for a while, you'll find that testable hypotheses will sprout forth. These hypotheses will in turn suggest smart experimental designs.
- Your initial question and theory might be quite broad and big. But in the end you must adopt a hypothesis that is **tight** and **testable**. Simpler is almost always better! A common mistake is to tackle something that's way too big, like an entire theory. Remember, good theories spawn **narrow, specific** predictions. And that's what you test.

- Throughout this project, show initiative, independence, inquisitiveness, inventiveness, leadership, organization, and self-motivation. This is real science, real investigation, real discovery. Students who only like to learn by waiting for information to come to them are doomed to struggle here...
- Modern science is very much a collaborative enterprise. Scientists work together, think together, and write together in teams (“multiple authorship”). I strongly recommend teaming up with one or two other classmates! **Note, however, that most VJAS scholarships (not the awards) are available only to single-author papers.**

**Sequence & Due Dates:**

1. **Question and Theory** – a one-page summary of your GENERAL question and topic, along with a brief theoretical discussion of the matter. Frame your question and ideas in the context of the relevant scientific field (marine science, environmental science, biology, chemistry, physics, math, or whatever...), supported by at least two literature sources. **Do NOT get into experimental design here! Due: Wednesday April 22<sup>nd</sup>**
2. **Feedback and Brainstorming** – You or your team will have a faculty advisor (probably Goff) who will help coach you through your research. **Schedule an appointment for a “skull session” either after CBGS classes or at your home school.** We’ll also conduct in-class workshops on how to plumb the scientific literature using library resources and how to read a scientific paper.
 

*\*\*\*Helpful Hint: You can make your scientific literature search MUCH easier by actually visiting the library at VCU, UMW, W&M, VIMS, or some other public college in Virginia (but not RCC ...too limited). See the CBGS Lit Search Guide for good advices.*
3. **Prospectus** – This is your formal research proposal. For guidance, you are STRONGLY urged to thoroughly review the “CBGS Manuscript Format for Science Research Projects” as well as Goff’s sample prospectus on sea scallops (containing helpful cartoon bubbles in the margins). **My expectations for quality are very high indeed, and I grade tougher on this (and your big Final Paper next year) than anything else.** Remember, this is a hefty exam grade. **Due: Friday May 29<sup>th</sup> ...NO EXCEPTIONS OR EXTENSIONS!**

**BEST ADVICE:** prior to the due date, schedule an appointment with me to sit down with you and go over your first draft. I can help! All you have to do is ask.

