This month’s Paths and Places contribution is from Naomi Ward and colleagues Kristopher Parker and Jason Gigley at the University of Wyoming. They write about their GI research at a somewhat geographically-isolated institution without a medical school, and provide advice on topics including funding and institutional resources. Pam Tuma, the May Paths and Places columnist, who is also at an institution without a medical school (although located within a research-intense corridor on the East Coast), provided advice on managing time, teaching, and undergraduates, while Dr Ward and colleagues highlight funding and institutional resources. Both columns emphasize the importance of collaborations and networking, although from different perspectives. We hope these two features are helpful to scientists at non-research–intensive schools who, nonetheless, aim to pursue vigorous GI research programs.

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Paths to GI Research in the Wild West: Tales From Wyoming

Pursuing gastrointestinal (GI) research in Laramie, Wyoming, is possibly as far from the standard medical scientist-in-an-academic-medical-center setting as is possible. Our town of approximately 30,000 people is located on a high plain in the southeast corner of the state, and is home to the University of Wyoming (UW), the state’s only 4-year university. Although by Wyoming standards we are not far from a major metropolitan center (Denver: 130 miles), the distances (and often impassable winter roads) sometimes can be isolating. UW faculty generally carry a teaching load that is heavier than seen in medical schools, and it can be difficult to recruit qualified research personnel to our semirural location. We also lack a usual requisite for biomedical research—we have no medical school. Pursuing GI research in this setting therefore can be quite challenging, and this article describes how we have been able to meet some of those challenges.

Our research interest is the GI microbiome in pediatric health and disease, with a specific focus on Hirschsprung’s disease (HD). This is a developmental disorder featuring the absence of enteric ganglia, with enterocolitis being the most serious complication. We are seeking to understand the role...
of the microbiome in the onset and development of Hirschsprung’s-associated enterocolitis, providing a foundation for the longer-term goal of developing therapeutic interventions. We work with both human subjects and the Endothelin Receptor Type B null (EdnrB−/−) mouse model to study the HD microbiome.

**Collaborations**

We partner with Allan Goldstein, the Chief of Pediatric Surgery at Massachusetts General Hospital for Children. Dr Goldstein’s basic science and clinical research program focuses on improving the diagnosis and treatment of children with disorders of intestinal motility, such as HD. In our microbiome project, Dr Goldstein’s group originally performed all the EdnrB−/− mouse work because the model was not available to us in Wyoming. However, recognizing that exposure to mouse work would be very beneficial for our students, we worked with Dr Goldstein to bring the EdnrB−/− mouse to Wyoming. We now have a thriving colony, and the mouse-wrangling skills of our students have been developed further through the generosity of Dr Goldstein’s research group in hosting Wyoming students for visits to his Boston laboratory. Dr Goldstein also provides critical access to human subjects. This is truly an example of a project that would not have been possible for us without a strong collaboration.

**Funding**

We currently are funded by an R15 award from the National Institute of Diabetes and Digestive and Kidney Diseases. The path to this funding success was quite long, with the first proposal submitted by one of the authors (N.W.) in 2012. Reviewers recommended enhancing the Wyoming component, so our resubmission in 2013 featured an additional Wyoming Co-Primary Investigator with experience in immunology and use of mouse models (J.G.). In addition to strengthening our research team, we proposed establishing the EdnrB−/− mouse model in Wyoming, as described earlier. These revisions brought our resubmitted proposal into the fundable range, and we received funding in 2014. As we near the end of this 2-year award, we unfortunately are not eligible to renew because the UW recently surpassed the institutional National Institutes of Health (NIH) funding threshold used to determine R15 eligibility. However, we have made sufficient progress to plan submission of R01 proposals in the near future. We also have benefited from support from institutional awards (eg, NIH Institutional Development Award (IDeA) Networks of Biomedical Research Excellence (INBRE)), in the form of graduate assistantships and undergraduate fellowships. We would encourage biomedical researchers in comparable institutional settings (land-grant universities) to explore similar paths to establish their extramural funding. If your institution resides in an NIH Institutional Development Award state, you may be eligible for funding through the R15 mechanism, or co-funding of a proposal that has scored well, but above the pay line, through another mechanism (eg, R01, R21, or R03). If your university holds institutional awards such as an INBRE or Centers of Biomedical Research Excellence, it is a good idea to discuss internal funding opportunities, such as graduate assistantships, pilot grants, or thematic grants, with administrators of those programs. Even if your institution or state is not eligible for these awards, there frequently are other institutional small-grant programs that can provide the support needed to acquire critical preliminary data. Many of these programs are targeted toward junior ( untenured) faculty, but researchers frequently are unaware that, increasingly, senior investigators seeking to enter new research fields are eligible for support. We suggest applying early and often.

One challenge that we face, outside the R15 funding mechanism, is negative reviewer evaluation under the NIH environment criterion, simply because we live and work in Wyoming, and not in a metropolitan research-intensive location. Unfortunately, this can occur despite evidence of strong individual research performance, as documented in biosketches, and more-than-adequate institutional facilities, also documented within a proposal. This is one challenge that is very difficult to overcome, other than by persistence and continued strong research productivity.

**Personnel**

Our project has trained 1 graduate student (K.P.) and 3 undergraduate students to date. We rely heavily on student researchers at the UW, in part because recruitment of suitably qualified postdoctoral fellows to the Mountain West often is difficult; postdoctoral graduates often want to be located in research-intensive areas of the West and East coasts, unless they have specific personal reasons to live here. We are able to meet this personnel challenge through the availability of an interdisciplinary PhD program (Molecular and Cellular Life Sciences, [http://www.uwyo.edu/mcls/](http://www.uwyo.edu/mcls/)) that supports the stipends and associated costs of each student in the first year. This program attracts high-quality applicants, and the programmatic first-year support provides a bridge mechanism for faculty attempting to secure their first NIH funding. We also benefit from an undergraduate population with high enthusiasm for performing hands-on research, and several institutional awards that provide research fellowships for these students. Providing worthwhile research experiences for these students requires careful mentoring at the bench, and our project has benefited from the recruitment of a student (K.P.) who enjoys this mentoring interaction and puts a lot of time into undergraduate training.

**Teaching and Other Nonresearch Responsibilities**

Research-active UW faculty carry teaching loads that are typical for land-grant institutions, and the research component of their job descriptions typically is limited to 50% to 60%. Juggling research with these other responsibilities does pose a challenge, which can be met partly
by recruitment of laboratory personnel (mostly graduate
students) who can work independently from an early stage,
and also can train and mentor more junior personnel (as
described earlier). Often these students also function as de
facto laboratory managers because state-supported staff
positions have become quite rare. It is fair to say that
research success in a place such as Wyoming sometimes
rests heavily on students with an unusual degree of inde-
pendence and maturity.

Institutional Resources

Research success for 2 of the authors (N.W. and J.G.) has
been possible through the support of a number of different
institutional resources, including generous start-up funding
from departmental and college sources and pilot grants
from institutional programs designed to enhance research in
Wyoming (NIH INBRE and National Science Foundation
Experimental Program to Stimulate Competitive Research
(NSF EPSCoR)). We also have benefited from a supportive
Office of Research and Economic Development that provides
structured training and mentoring in grantsmanship,
including one-on-one proposal development with an ex-
perienced grant-writing consultant. Although many in-
stitutions provide orientation sessions for new faculty to
familiarize them with the services provided by such offices,
we still would advise meeting one-on-one with the key staff.
This allows investigators to learn the details of proposal
preparation, submission, and administration at their specific
institutions. It also provides a face with a name for these
support staff, which can be helpful when you are in need of
assistance with your early proposals. Finally, these offices
frequently have a role overlooked by new investigators,
which is providing support for protection and development
of intellectual property. Considering these aspects of your
work earlier rather than later can help you avoid problems
relating to intellectual property, such as the timeline
required for submission of patent applications relative to
publication of relevant scientific findings.

Conclusions

Pursuit of biomedical research can be challenging at land-
grant institutions in states historically under-represented in
NIH funding, especially those lacking a medical school.
However, these challenges can be overcome in a number of
ways: (1) through developing strong partnerships with
external collaborators who can provide access to clinical
resources and expertise; (2) by exploring the diversity of
funding opportunities available to researchers in this kind of
institutional setting, particularly the NIH R15 mechanism,
institutional awards designed to enhance research excel-
lence, and internal small-grant programs; (3) careful
recruitment of graduate students and other trainees who
perform well in a research environment that involves un-
dergraduate researchers, and often lacks institutional sup-
port for technicians and laboratory managers; and (4) taking
advantage of institutional resources, especially the offices
that provide support for acquisition of extramural funding.

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Conflicts of interest

The authors disclose no conflicts.

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