Wider aspects of a career in entomology. 21. Further institutional adventures

Hugh V. Danks

This series of articles outlines some ancillary aspects of my entomological career. The approach includes information about insects and their environments, conclusions about scientific activities and their setting, and general observations. This article is based on my work at a number of different scientific establishments.

Most research and teaching in entomology is based at universities or government centres, and I profited from the facilities at such institutions during my career. Properly equipped laboratories and offices, field stations, libraries, rearing rooms, insect collections, workshops with knowledgeable staff, qualified photographers and artists, and even ancillary meteorological records all helped my work.

Nevertheless, some memorable experiences arose from institutional shortcomings—and thus identified effective elements by illustrating the reverse! Moreover, substantial changes have taken place over the years in science, technology, administration, institutional support, and other factors, prompting further conclusions.

Building layout and design

Establishments that are efficiently laid out have all facilities within easy reach, but many places are less compact. For example, Brock University in St. Catharines, Ontario, featured two separate campuses for nearly 20 years, including my time there. For even longer, various components of my institution in Ottawa, the National Museum of Natural Sciences, later renamed the Canadian Museum of Nature, were spread across town in different buildings.

Brock University began in 1964 at the foot of the Niagara Escarpment, in an abandoned refrigerator factory that had been refurbished (Figure 1)[1]. Two years later, a new building opened on the main campus at the top of the escarpment. Other buildings followed, but the Department of Biological Sciences remained on the lower campus until 1983. When I arrived in 1974, biology and other science departments were still at that "temporary" location, but all lectures were held at the main campus. Although the venues were only about 2 km apart, the frequent journeys by shuttle-bus to and from every lecture were a major time-consuming nuisance.

Imperfections are more likely in such older buildings, even if they have been renovated. For example, layouts and ventilation were inadequate in areas of the old factory that had been converted into laboratories. When I sorted preserved insect specimens, the faint fumes of

[1] An electricians strike delayed the opening, so for several weeks after the term started, classes were held in a local church.

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ethanol they gave off might be masked by the overpowering stench of the food and droppings of gull chicks that were being reared elsewhere by one of the zoologists.

Earlier, when I was an undergraduate in London, England, improvements were made to the long-established zoology building of Imperial College. One addition was a sturdy wall mount for a high-speed centrifuge. This feature was not welcomed on the other side of that wall, where the room housed an electron microscope highly sensitive to vibration!

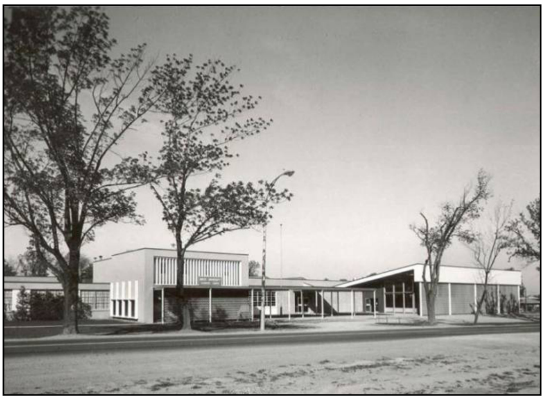

Figure 1. Lower ("Glenridge") campus of Brock University in St. Catharines in the 1970s, formerly the Frozenaire Cooler Company plant.

The Silwood Park field station of Imperial College (site of my doctorate) had a number of Nissen huts (Figure 2). Those pre-fabricated buildings, made of corrugated steel in the shape of a half cylinder with a concrete base, were mainly used in wartime for military purposes. At Silwood—as in other places in England—they continued in "temporary" use for years, but exceeded their life expectancies by a substantial margin and steadily became less satisfactory.

Figure 2. Nissen hut in England.

Better facilities are possible in new construction. Nevertheless, a building devoted to science and education has specific needs. In contrast, the earliest architectural plans for a new building for the Department of Biological Sciences on the main campus of Brock University simply copied one existing model for business offices. Faculty were clustered around a central office hub with no intervening walls. This design would hinder study, lecture preparation, discussions with students, and so on, prompting comments that were not positive … nor necessarily polite.

Despite similar inadequacies, the Government of Canada came to favour open-concept designs (Figure 3). They were adopted chiefly because small cubicles cost much less to build and heat than separate offices. Equipping them with standardized furniture modules leads to suboptimal office layouts for some employees, but reduces costs further.

The open concept was sometimes justified to those forced to work there by invoking "team-building", "interior design flow", and other nonsense, even though the auditory and visual distraction of students in open-concept schools was already well known.

Figure 3. Offices in the form of a series of cubicles, the so-called "cubicle farm".

Furthermore, we now know that people in open-concept spaces seek to have less rather than more contact with colleagues, reducing rather than enhancing "team-building".

A cubicle is particularly unsuitable as an office for a scientist, because the surrounding disturbance hinders quiet thought. Prolonged concentration is required to interpret data, integrate the findings of others, and prepare material for publication to make it accessible to the scientific community.

In most places I was fortunate to have walled offices, but my generalizations about disturbance were strongly confirmed when I did not. For about 8 months (during studies of arctic mosquitoes with Philip Corbet at the University of Waterloo, Ontario), my laboratory was shared with another entomologist who regularly typed out references and other items. The noise of his typewriter disrupted my attempts to interpret data and draft text, so I started my own typing tasks whenever he began—and the typewriter, and my maniacal style (developed earlier by pounding a massive vintage machine in England), were even noisier!

For another few months at the National Museum of Natural Sciences, my office was a section of the shipping room that had been partitioned off for me. There, concentrating to find the right word for a manuscript, I might be startled by a sudden burst of noise as shipping tape was pulled off its roll just beyond the partition.

My office was a government cubicle during a period that included intensive writing, editing, and publishing of the Biological Survey's book *Insects of the Yukon* (1997). My neighbour frequently held extremely long and noisy telephone conversations. His voice was so much louder than anyone else's that I thought he probably had no need of a telephone anyway, even for overseas calls. (There was no cubicle on the other side of him.)

Polite suggestions to modify this behaviour, or to use the telephone provided elsewhere for the purpose, were rebuffed. My solution was to keep ready an emergency file, containing appropriate tasks, to take to a small space inside a quiet little storage room nearby, albeit one that had no window.

A later discovery was that the noise in my cubicle could be made tolerable by ear protection akin to that used by people who guide jet aircraft on airport aprons (Figure 4). Colleagues knew why those decibel-reducing earmuffs were needed, and were sympathetic; but one of them told me that my manager (who might walk past my cubicle when he ventured from his enclosed office to attend a meeting) had commented about how often I "listened to music" there!

Hugh Danks

Figure 4. The noise-reducing earmuffs referred to in the text.

Cubicles were one feature of the new campus of the Canadian Museum of Nature, built for the research division and other sections, which opened officially in 1997. Another modern feature of the design was large windows (Figure 5). However, they let in so much light that the glare made it almost impossible to read computer screens on sunny days. Therefore, adjustable solar blinds were installed. Unfortunately, they were not flush with the ceiling and the glare was not eliminated. To avoid reinstalling or replacing the blinds, every employee was issued with a baseball cap instead. This solution was by no means fully effective (although the peak of the cap did provide shade to the eyes), but

Hugh Danks

Figure 5. Large windows at the Natural Heritage Campus of the Canadian Museum of Nature in Gatineau, Quebec.

employees were supposed to be pleased nonetheless—because each cap was enhanced by the museum's logo …

In buildings with normal rooms rather than identical soulless cubicles, large and well-located offices are more desirable, and usually are assigned on the basis of seniority. At one Canadian university, the most senior member of the department retired. Everyone then expected to ascend the ranking of privileged rooms, starting with the coveted office just vacated. A memorandum outlining the necessary intricate sequence of time-consuming office and laboratory moves occupied several pages.

A parallel hierarchy often applies to parking, especially at some long-established universities with limited space. Senior employees receive permits to park in more convenient areas, where institutional parking restrictions are eagerly enforced.

The parking hierarchy tends to be jealously guarded, even when it is not official. After a move to one Museum office, I parked in front of the building (Figure 6) in a vacant, unlabelled space. Unknown to me, this was the customary parking place of an illustrator, an employee of long standing. My "transgression" caused the employee to storm around the building threatening to call the police (although the police would have no jurisdiction in the matter), after he had blocked my vehicle by parking behind it to prevent its escape from the scene of the "crime". Such behaviour indeed served to inhibit colleagues from using "his" space, but may not have improved their view of him.

Hugh Danks

Figure 6. The building in Ottawa, with parking spaces in front, that is mentioned in the text.

Building services and maintenance

Properly maintained buildings enhance efficiency. It is much easier to work when temperatures are comfortable, elevators work flawlessly, the supply of electricity is reliable, and even minor tasks (e.g., replacing light bulbs and oiling door hinges) are attended to. During my initial research in Canada, I spent hours outside during the winter studying insect cold hardiness, and on return greatly valued the reliable warmth of the laboratory. In North Carolina, overheated from fieldwork in the summer, I greatly valued the reliable air-conditioning.

In contrast, the lower campus at Brock University that housed biology faculty was under-resourced and often cold in winter. Faculty were therefore astonished to learn that relatively new administrative offices on the main campus were being refitted with expensive luxury carpets. This disclosure prompted the chair of the department to write a satirical letter to the University President. He noted that the old carpets were still serviceable, and therefore his department would be happy to receive them. He pointed out, for example, that they could be used to cushion the hard utilitarian floors of our old converted factory; they could be applied to the poorly insulated walls to defend against the cold; and they could even be burned as fuel when, as had become customary, the building ran out of fuel during the winter. Of course, the implied admonition was met with typical administrative humourlessness, but members of the department were supportive!

Before researchers and collections moved to the new national museum building mentioned above, some of the temporary premises they occupied were not fully maintained. One long-term rental (the "Beamish building") housed substantial collections of fish and other

Hugh Danks

Figure 7. Multiple buckets placed to catch drips from roof leaks, as in the inadequately housed collection in Ottawa mentioned in the text.
The image used for this simulation (modified from Bambi, CC BY 4.0) shows a collection that has no such problems.

organisms. However, the roof leaked, requiring a judicious arrangement of buckets to catch the numerous drips after it rained. This array (cf. Figure 7) was left in place during the official visit of a representative of the government agency responsible for museums. Even so, it was many years before the necessary new building was provided.

My work at the museum in Ottawa began at "Holly Lane"[2], where two rented buildings were already in use. My shipping-room office was in one of them, and a later office was in the other (Figure 6). Those "temporary" premises, and their imperfectly-housed collections, were not vacated until more than 17 years after my arrival.

Other elements

Some resources for general use are best supplied by institutions rather than set up by individuals. They include field stations and greenhouses, which underpin much entomological research and teaching, especially in ecology. Some of my own work relied on insectaries, structured farm crops (cf. Figure 8), and other field-station resources. Appropriately sized and serviced vehicles gave access to field sites, and included the imposing station wagon made available in North Carolina (Figure 9).

Centralized indoor rearing facilities are also valuable. In North Carolina, they supported my research especially by supplying considerable numbers of diet cups for caterpillars collected in the field [article 6]. However, large-scale rearing facilities are expensive to maintain at a high standard. Substances that might harm insects or their development must be strictly prohibited in all adjacent areas, and inbreeding prevented if the stock is to remain representative of field populations. So must selection for reproductive success. Inadvertent selection can result from

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Figure 8. Disk harrow, like one used to prepare the tobacco crops supporting entomological research in North Carolina.

Christopher Ziemnowicz (CC BY 4.0)

Figure 9. Chevrolet station wagon of the type used by the author in the 1970s for daily journeys to the field station and other locations in North Carolina.

[2] I assumed that the address was a pleasing echo of past vegetation, but in fact it was the name of the developer's daughter.

differences among individual insects in mating behaviour or developmental rate, for example, as well as from biases introduced by the work schedules of staff.

Refrigerator-sized cabinets provide adequate experimental regimens of temperature and photoperiod for small-scale rearing and for investigating the control of insect life cycles. However, some kinds of studies profit from larger environmental rooms that are centrally maintained. Walk-in freezers are particularly effective for experiments at low temperatures. One held at –18°C helped my early work on cold hardiness. It was comforting to know that it could be opened from the inside, and could not be locked!

Other specialized assets are important. Libraries and library services provide critical support, because science makes progress mainly by building on existing knowledge.

Reference collections of insects are invaluable, not just for revisions and identifications carried out by taxonomists, but also for local studies of all kinds. Because scientific information is organized by species, local reference specimens favour timely identification and prevent incorrect associations or groupings of research data. My own studies were assisted by local reference collections … even when I had to develop them myself.

Institutions also furnish general assets that may include office supplies, photocopiers, personal computers, printers, and computer networks. The work of employees is favoured too by adequate means for coffee breaks (and meals), which restore energy and encourage beneficial informal interactions among colleagues[3]. The settings available to me for this purpose varied greatly from place to place—as did the quality of the coffee!

Historical changes

Considerable changes in institutional resources took place during my career. Some of them were extremely positive. In particular, the development of digital technology gave remarkable new capabilities for word processing, publication, photography, and communication.

Advances in word processing (Figure 10) exemplify the changes. My early letters and manuscripts were produced with typewriters, which progressed from giant mechanical devices to more or less compact electric models. In the 1980s, machines dedicated exclusively to word processing were developed. They allowed text to be viewed on a cathode-ray-tube screen, manipulated electronically, and stored on floppy disks. Later developments brought portable software, notably WordPerfect and Microsoft Word, that could be used on general-purpose computers.

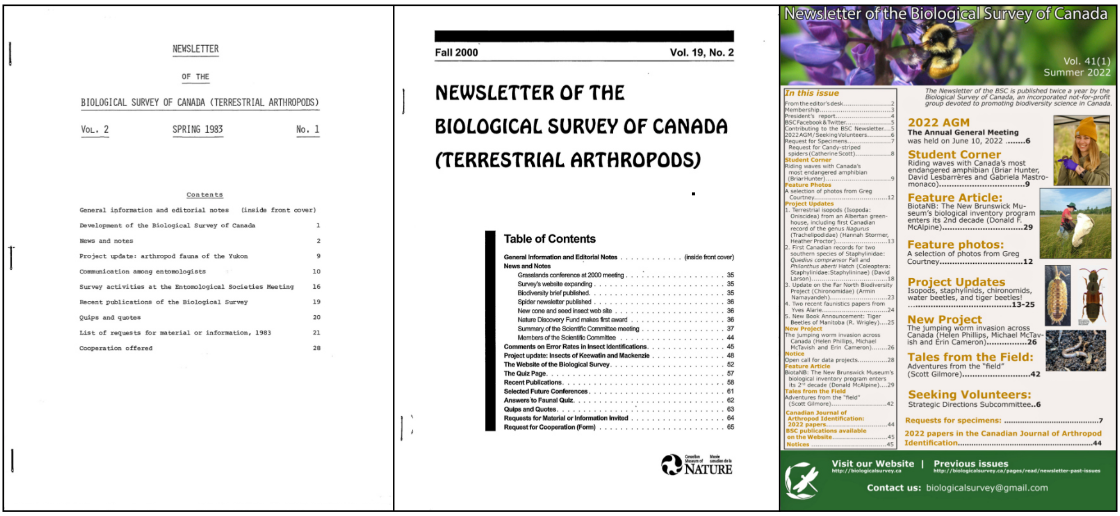
The evolution of these capabilities was relatively rapid.

Figure 10. The development of machines used for word processing. L to R from top to bottom: Vintage typewriter (probably 1940s; with moving paper carriage); Electric typewriter (1970s; with rotating type-ball); Dedicated word-processor (1980s); Modern personal laptop computer (now more common than larger desktop machines).

[3] Indeed, an introduction to the 1986 proceedings of the Biological Survey of Canada’s symposium on soil arthropods invoked the role of coffee as a social lubricant for the idea of the symposium. John Spence wrote “the machinery of human interactions is facilitated by several lubricants, of which coffee is one of the most important in our society.”

Therefore, for example, the institutional platform for the manuscript of my book *Insect Dormancy* (1987) changed while the text was being completed, and then again when it was updated as funds were sought for publication. Every switch revealed incompatibilities between platforms. When the manuscript was transferred from a word-processing machine to a computer system, any character that was not recognized by the new software was replaced with a capital S. Time-consuming corrections of hundreds of pages, some with dozens of S characters, were then required.

Powerful software for desktop publishing as well as word processing evolved as computers became more capable. The first newsletters of the Biological Survey of Canada were simply black-and white photocopies of typed pages. Later issues were made available as pdf files as well as hard copies. Some other specialized Survey newsletters distributed in smaller numbers were printed with colour illustrations when the cost of doing so (with inkjet printers) plummeted. Recent web-only newsletters have more complex layouts and are profusely illustrated in colour (Figure 11).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Contents

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NEWSLETTER OF THE BIOLOGICAL SURVEY OF CANADA (TERRESTRIAL ARTHROPODS)

Table of Contents

Canadian Museum of Nature / Musée canadien de la Nature

Newsletter of the Biological Survey of Canada

Vol. 41(1)
Summer 2022

In this issue

The Newsletter of the BSC is published twice a year by the Biological Survey of Canada, an incorporated not-for-profit group devoted to promoting biodiversity science in Canada.

2022 AGM
The Annual General Meeting was held on June 10, 2022 6

Student Corner
Riding waves with Canada's most endangered amphibian (Briar Hunter, David Lesbarrères and Gabriela Mastromonaco)..........9

Feature Article:
BiotaNB: The New Brunswick Museum's biological inventory program enters its 2nd decade (Donald F. McAlpine)..........29

Feature photos:
A selection of photos from Greg Courtney..........12

Project Updates
Isopods, staphylinids, chironomids, water beetles, and tiger beetles! 13-25

New Project
The jumping worm invasion across Canada (Helen Phillips, Michael McTavish and Erin Cameron)..........26

Tales from the Field:
Adventures from the "field" (Scott Gilmore)..........42

Seeking Volunteers:
Strategic Directions Subcommittee..6

Requests for specimens: 7

2022 papers in the Canadian Journal of Arthropod Identification..........44

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Hugh Danks/Biological Survey of Canada

Figure 11. Early, later, and recent issues of the Newsletter of the Biological Survey of Canada (1983, 2000, 2022), illustrating advancements in presentation software, as well as the ability to use complex colour layouts for web documents that do not have to be supplied free of charge in printed form.

Digital photography and sophisticated software dramatically enhanced the ways in which images could be generated and modified. Most early publications had mundane black-and-white illustrations, whereas highly relevant images of exceptional quality can now be obtained in far less time. Computer-assisted scanning allows detailed three-dimensional illustrations of insects to be generated for taxonomic research. Power Point software supports image-rich presentations that are easier to assemble, and potentially of higher quality, than those using projected transparencies. The various colour images can be printed much more cheaply than in the past, and also made available electronically.

The arrival of the Internet allowed such images to be posted online, and it brought many other positive developments. Communication became a great deal easier as institutions implemented email systems, even though some first efforts were unreliable. Before then, my editorial contacts with chapter authors (by typed correspondence) were considerably slower and more difficult.

More and more information became accessible on the web. Older documents were scanned and uploaded, and increasing numbers of journals were published online. Consulting and checking the references for my earlier publications required access to hard copies. A substantial (though still strikingly limited) fraction of material can now be viewed online, although institutional subscriptions may be required.

A less positive development was increased building security. Augmented initially to offset a rise in local theft, it became onerous soon after the turn of the millennium in response to the threat of global terrorism. When I started work in Ottawa, many different entrances to the research building were open all day. Later, only the main entrance was unlocked, with security guards enforcing strict entry policies.

Entry to many libraries was also restricted, and not even employees or affiliated scientists were permitted in the stacks. My final checks for the accuracy of the 2 750 citations in *Insect Dormancy* depended on access to all parts of the main Agriculture Canada library. Without admittance (which is now denied), checking would have taken much longer.

When security increased, a wide range of personalities was unveiled as more guards were hired. These people served as the face of the institution in buildings with public access, and established positive or negative impressions among visitors. At the Canadian Museum of Nature's new building (with a library open to the public), the security guards were pleasant and helpful. Elsewhere, however, some personnel treated every visitor as a likely criminal.

Security was not always strong before the increased vigilance. The regular daytime guard at Holly Lane was a retired gentleman with reduced mobility, who used the elevator even during security rounds. When the elevator failed on a weekend he was stranded inside for hours until rescued; in the meantime, the building was left unguarded. Another guard at Holly Lane simplified the required hourly activation of checkpoints located throughout the building by forcibly removing the key components from every checkpoint and putting them in the drawer of his desk overnight, where he could easily access them each hour. They were reinstalled after he was fired.

Other institutional changes resulted from concerns with workplace safety. Pests were once routinely kept at bay in dry collections of insects and plants by liberal and widespread use of naphthalene, and later paradichlorobenzene. During the 1970s, I visited a botanist at the Central Experimental Farm in Ottawa who worked in a small room, high in the building, that reeked so strongly of paradichlorobenzene that my eyes watered; but, adapted to it, he said that he could not smell it at all.

When volatile substances of this sort were banned because of their potential toxicity (Figure 12), collection managers were forced to police additions to the collection more tightly, and to freeze all material at low temperatures before accession, to kill any pests.

Possible exposure to harmful substances was also reduced by new building codes. Offices and related air ducts were to be separated from fume hoods, and from laboratories housing certain reagents. This was inconvenient if the two spaces became far apart. A few older buildings with offices and laboratories in close proximity nevertheless received only essential adjustments in airflow, because it was impracticable to modify them further.

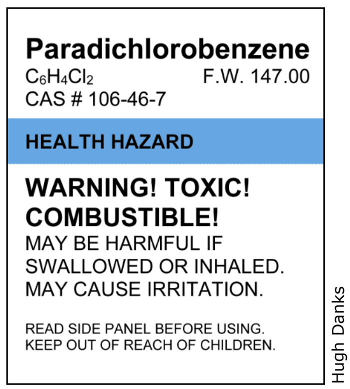

Figure 12. Bottle label warning about Paradichlorobenzene.

Last but by no means least, disruptive managerial changes took place at Canadian government institutions, beginning during the late 1960s and continuing until today. They stemmed from realignments in national funding for science, coupled with "top-down" management schemes intended to save resources by controlling both research topics and local facilities. Among the outcomes, scientific enquiry was hindered, and small, noisy cubicles (as noted above) were assigned to some scientists.

Too many managers in the new system did not understand the requirements for effective scientific research, or were unable to educate their political masters about them. Flaws included a focus on short-term goals and on topics that were temporarily popular, distrust of input from employees, attention to process rather than relevant output, insufficient scientific knowledge, and undue ambition for personal advancement. The preoccupation with control also brought in additional managers and time-consuming paperwork (much of which proved to be superfluous or unnecessarily detailed). Existing resources were siphoned off to support this system.

Costs were saved elsewhere in a number of ways. Prevalent among them was a reduction in library budgets. Book purchases were limited, journal subscriptions winnowed, branch libraries eliminated, and (in places) volumes that had rarely been consulted discarded. Some irreplaceable documents were destroyed as branches closed or organizations moved to smaller premises. Even in the short term, these cutbacks had a significant impact. For example, some reference materials could no longer be supplied quickly or easily, and lack of personal access to broad library holdings diminished the level of scholarship.

A few general resources that had been provided routinely were withdrawn, including most typing services. At the time it was asserted that money had been saved, although initially these "benefits" came merely from doing less[4]. At some universities, additional costs were transferred to individual research grants (e.g., for certain supplies and photocopies).

In buildings where existing facilities for coffee and meals were eliminated in the name of efficiency (to repurpose the space, and in some cases to ensure patronage of an in-house outlet), profitable discussions among colleagues were less likely.

The managerial changes meant that, in Canada as a whole, projects that reflected popular or ephemeral trends were favoured, and institutional funding was redirected. As a result, there were fewer sustained projects able to generate the long-term data sets that are especially valuable for the progress of science.

Final comments

I drew several lessons from my exposure to the features and foibles of institutions.

First, central facilities that directly enable scientific work, such as libraries, field stations, collections, and certain major equipment, are of great benefit. It is therefore important to emphasize their value at every opportunity.

Second, the effectiveness of entomologists depends on many employees beyond those who assist research directly (e.g., technicians) or indirectly (e.g., secretarial assistants). Staff responsible for building maintenance, security, computer and related technologies, ordering, shipping, mail, cleaning, and other tasks ensure that the institution as a whole is safe, supplied, and fully functional. During my career, I was surprised to find that some colleagues, especially a few senior ones in some locations, did not afford to all of these people the fair and respectful treatment that everyone deserves.

All institutions had some deficiencies, as might be expected. However, at least in institutions of the Canadian government the greatest impediments came from attempts to control every aspect of the operation in the name of efficiency. Far too often, these efforts conspired to obstruct scientific endeavours because of politics, ignorance, personal ambition, and cumbersome administrative processes.

I found that the best way to offset such distractions was simply to focus on the entomological interest of the research. There is something fascinating to be discovered under any circumstances. In addition, even limited funding does not prevent the synthesis of

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[4] Personal computers and word-processing software allowed any individual to type memoranda and other documents. The focus on cost-cutting meant that typists were laid off (a trend that started even before computers were widely available), and scientists were required to prepare their own manuscripts. The switch was so rapid that some older scientists with no typing skills were forced to keyboard long manuscripts, even those with complex tables. They would take much longer than typists, who earned considerably less. The inefficiencies were gradually reduced, because children now learn keyboarding and computer skills at school.

information and the development of ideas, which not only have general value[5], but also help to identify the specific studies most likely to be worthwhile.

Moreover, the capabilities of individual institutions can be extended significantly by cooperation with colleagues, both locally and farther afield. Shared projects give access to additional specialized knowledge, equipment, and data, and help to foster ideas.

Despite the weaknesses outlined above, the institutions that supported my career provided adequate facilities overall. Most places (and granting agencies) relatively quickly accepted new technologies for experiments, as well as tools for more efficient word-processing, data analysis, generation of graphics and images, printing, and internet communication. Therefore, driven by the energy of those interested in entomology, and assisted by institutions, science continued to advance.

[5] This theme is illustrated by Leigh van Valen's backhanded acknowledgement in his 1973 paper introducing the Red Queen hypothesis ("it takes all the running you can do, to keep in the same place"). He thanked the United States National Science Foundation for repeatedly declining to fund his honest grant applications, forcing him into the theoretical considerations that led to the paper. Many scientists followed up his ideas, so the paper had a much greater impact than most accounts of specific research.

Hugh Danks retired in 2007 after many years as head of the Biological Survey of Canada. In that role, he helped to coordinate work on the composition and characteristics of the arthropod fauna of the country, and to summarize the results. In addition, his research studied cold-hardiness, diapause, and other adaptations to seasonality in northern regions.

Articles in this series: Danks – Wider aspects of a career in entomology

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