Introduction: Current Challenges and New Directions in Lithic Analysis

DANIELLE MACDONALD AND JAYNE WILKINS

The Lithics and Technology Group at the University of Toronto called together any and all graduate students that focus on lithic material to attend the first ever Graduate Students Lithics Symposium in February, 2010. The event served as a venue for graduate students to share their current research methodologies with their peers interested in lithic technology studies. The goal was to facilitate scientific exchange, generate feedback, questions, and discussions that would help to advance innovative research. The title was “Between a Rock and a Hard Place”, emphasising the many challenges faced by lithic analysts today. It was suggested that one of the most important challenges we face is the incorporation of new methods and techniques such as spatial analysis, residue and use-wear analysis, raw material sourcing, digital imaging and 3D scanning into our analyses, not as an end in itself, but as an integral step towards addressing the “big questions” of human interaction, exchange, technology, and meaning.

Eighteen students from the archaeology and anthropology departments of the University of Toronto, McGill University, Simon Fraser University, Arizona State University, University of Connecticut, University of Alberta, University of Victoria, McMaster University, and University of Western Ontario attended the symposium. In addition to the traditional conference-style presentations, the two-day event also included a lithics and data “show-and-tell” and a round-table discussion on the present and future state of lithic studies.

This special issue of vis-a-vis: Explorations in Anthropology includes a complete list of abstracts and submitted papers. What follows immediately below is a synopsis of the common themes that developed over the course of the lithics symposium and the round-table discussion. If there is one shared view on lithic technology studies that emerged from this symposium, it is that lithic analysis is a dynamic and changing enterprise that is a relevant and integral component of anthropological investigation.
New Technologies for Lithic Analysis

One of the commonalities seen in many of the papers presented at the symposium was the applications of new technologies for lithic studies. These new technologies allow researchers to pose novel questions of archaeological assemblages, opening previously inaccessible avenues of research. Some of the technologies discussed at the symposium included X-ray fluorescence (XRF), neutron activation analysis (NAA), geographical information systems (GIS), three-dimensional microscopy, digitization, and three-dimensional scanning of artifacts.

Several presenters discussed new technologies in the context of raw material characterization. Both Peter Bikoulis and Darryl Kirsch presented on the application of XRF technology in their studies of lithic raw material. Kirsch and Rudy Reimer/Yumks’ research showed the utility of this technology for identifying raw material classifications that are not apparent through visual identification. Their work highlighted the ability of these new technologies to move the field of lithic studies forward. Heather Kendall’s research (this volume) also focused on raw material characterization, using neutron activation analysis for her study. Her research explored how new techniques of raw material sourcing such as NAA can help us answer questions related to mobility, trade, and other social processes. Likewise, Bikoulis’ proposed research will integrate sourcing with exchange networks on the prehistoric Anatolian landscape. These new methods of raw material characterization allow lithic researchers to reassess assemblages and explore social process in the prehistoric landscape, incorporating scientific research with questions related to the social lives of past peoples.

New methods for approaching tool function was another common theme presented during the symposium. Issues and problems related to qualitative observation in functional studies was discussed in Danielle Macdonald’s presentation, where she advocated for new methodologies that allow quantification of wear features. Quantitative use-wear analysis allows for greater comparability between tools, assemblages, and between the results of different researchers. Macdonald’s paper (this volume) discussed the applications of the Alicona InfiniteFocus Microscope for lithic use-wear studies; a microscope that generates three-dimensional images of surface topography. The detailed resolution of images and the numerical data generated from this microscope allows for cross comparison of surface features between different tools and between different researchers. Also addressing issues of function, Benjamin J. Schoville and Kyle Brown’s research (this volume) focused on macroscopic edge damage on assemblages of lithic points. Schoville and Brown used GIS analysis on both experimental and archaeological artifacts to map macroscopic wear on tool edges. Through this research, Schoville and Brown showed that Middle Stone
Age points from the site of PP13 were likely used as cutting implements rather than as hunting tools. The novel application of GIS technology to map the location of edge damage on lithic artifacts demonstrates the innovative use of an established technology for new applications.

Other technologies presented during the symposium included the scanning and digitization of artifacts. Nicolas Cadieux demonstrated how through the use of an optical scanner, the two-dimensional digitization of artifacts can help researchers more adequately describe artifact size. His new method also allowed for the fast quantification of large lithic samples. Nicholas Waber (this volume) utilized animated three-dimensional digital models of bladelet removal from microblade cores to illustrate diagnostic features of core preparation methods visible on semi-crested blades. The visual display of lithics using this rendering technology allowed Waber to communicate complex information more accurately and with ease.

During the roundtable discussion the applications of the abovementioned technologies were discussed with a focus on how these technologies are impacting the nature of future lithic research. Several participants discussed how technology can be used a mechanism for integrating the public with archaeological research. The integration of media into archaeological presentations, such as the movie showed by Waber, engages the public through visual media while also providing a powerful explanatory tool. As well, the video showed by Hilary Duke captured the nuances of the teacher/student relationship and communicated the methods of her experimental study with excellent clarity. Multimedia presentations are easily accessible, engaging, and these new technologies have great potential to bring archaeology into the public sphere. Furthermore, new technologies allow for increased interdisciplinary research, as expressed by Duke’s work with psychologists and in Macdonald’s collaboration with mechanical engineers. Thus, technological advances are compelling lithic researchers to collaborate with other scholars in the fields of geography, geology, physics, psychology, ecology, engineering, and computer science.

The discussion then moved towards the question of whether future lithic research should be technology-based or question-driven. How are we integrating these new technologies into the archaeological questions we are asking? In his presentation, David Leslie showed how an important archaeological question, whether Middle Palaeolithic points were used as projectile weapons, can be scientifically and systematically tested. The research by Schoville and Brown addressed a similar question, but through a different methodology. Together, these contributions demonstrated how an important archaeological question can be tested using different scientific methodologies. The participants were in agreement that lithic researchers need to use new technologies and methodologies in tandem with theory and anthropological query, rather than using novel
technologies only because they are accessible. It was concluded that archaeological, scientific, or social questions should drive our research, and the application and development of new technologies should be oriented towards answering these questions.

**Different Scales of Analysis: What are the Assemblages we are Studying?**

The variety of papers presented at the lithic symposium highlighted the different scales of analysis used by current lithic researchers. Rather than focusing on one typological class or complete lithic assemblages, the presenters used a wide range of scales for analysis. As lithic research progresses, it is becoming increasingly important to identify how artifact samples relate to both the methodology and the research question.

Several researchers focused on microscopic information from artifact assemblages. For example, Monica Maika (this volume) investigated the microscopic wear patterns found on Palaeoindian gravers. This microscopic use-wear work, like use-wear work discussed earlier, focused on a small scale of analysis but generated large questions and fascinating results. Likewise, geochemical information and raw material characterization (as discussed previously) also provide a wealth of information about lithic assemblages at microscopic levels.

At the level of the artifact, the paper presented by Lucille Harris advocated for redefining tool typologies based on the working edge, rather than the complete tool itself. Thus, the morphology of the tool becomes unimportant; it is the function of the working edge that defines the tool’s typological classification. The scale of analysis in Harris’s work focuses on one aspect of the tool, a new way of approaching lithic assemblages. Also focused on assemblage level analysis, Jordan Downey advocated for the analysis of expedient lithic tool assemblages. These assemblages have often been ignored in favour of formal lithic tools. Through his research, Downey (this volume) was able to show the importance of detailed analysis of informal tools, suggesting that these assemblage level samples should be considered for future research.

In contrast to the micro-scale, other presenter’s research focused on larger, broader questions of landscape use, mobility, and settlement patterns. Lilian Dogiama’s presentation integrated lithic data with architectural remains to reconstruct settlement patterns in Early Neolithic Greece. The research by Andrew Riddle also had broad implications, focusing on technological change and how it relates to mobility patterns. Through the analysis of lithic assemblages from several Arctic sites, he suggested that change in technological sequences over time related to changes in raw material exploitation embedded in larger
landscape use. These and other studies demonstrated the role of lithic studies in addressing archaeological questions such as mobility, settlement patterns, and landscape use in prehistory.

Other authors advocated for the use of a multi-scalar approach. Both Petr Kurzybov and Macdonald’s research combined microscopic data with assemblage level analysis to gain insight into lithic material. The application of microscopic information such as use-wear with assemblage level information can also be integrated with site and landscape information, providing a holistic approach to lithic research.

Finally, Matthew Walls’ paper (this volume) moved beyond stone tools to situate lithic technology in a wider sphere of prehistoric technological systems. His paper reminds us that lithics are not isolated; they are incorporated into a full suite of technologies such as woodworking. Even if evidence of these other technologies have not survived, it is important to remember the wider context of the lithics that we study.

Responsibilities of the Lithic Analyst to the Academic and Public Communities

Another common theme expressed by participants in the symposium revolved around issues of ethical responsibility to both the academic and public communities. In her presentation, Jayne Wilkins stressed the obligation of archaeologists to re-examine lithic collections stored in museums and research institutions as the discipline changes and technological methods advance. She also argued that lithic analysts need to be actively engaged in research-oriented curation practices. With the shift in archaeology towards assemblage-focused research in the mid-twentieth century, lithic collections now consist of tens of thousands of pieces, presenting a new set of challenges to curators, museum staff, and the individuals interested in studying them. Archaeologists need to adopt a more active role in the ultimate fate of their acquired materials, ensuring that archaeological material is obtained and kept in a way that permits future research.

Related to the topic of academic responsibility, Emma Yasui presented her proposed investigation of the excavated material from two Early Jomon sites in northern Japan, which are currently scattered across numerous research museums and institutions. Thus far, the research that has been conducted on materials from these Early Jomon sites have focused on faunal and paleoethnobotanical remains and is mainly reported in Japanese. Academically, the discipline will benefit from an analysis of the lithic materials, and a synthesis of all data available for this time period in northern Japan that can help bridge linguistic divides and facilitate access to a wider academic community.
The round-table discussion spurred much discussion about the public responsibilities and community involvement. Like all archaeologists, lithic analysts have an obligation to the communities whose history they are researching, as well as to the communities involved in or affected by archaeological investigation. They seemed to be a general consensus that this responsibility was recognized by archaeologists, but not yet successfully operationalized. Archaeological data and interpretation remains outside the purview of public life – very few individuals have access to the relevant information and resources they need to connect with archaeological investigations in any meaningful way. This becomes an issue of open access, which in today’s world can be facilitated with online resources. As archaeologists we have responsibilities to both the academic and public communities to make data, information, and collections accessible to the various stake-holders affected by our investigations.

The use of the internet also opens new avenues for public archaeology and sharing of knowledge. For the first time, archaeological research is available to a wider audience, both academic and public. Open source programs allows for the dissemination of knowledge significantly faster than traditional methods. Thus, the internet allows archaeological lithic research to reach new audiences as quickly as knowledge is being generated.

The question of how to further engage the public in lithic analysis was also brought to the table. Advances in visualization techniques made possible by digital 2D and 3D imagery, animation, and video can be coupled with online media resources to educate and inform the public about lithic reduction, excavation, and analysis. Initiatives to make information available this way need to be thoughtful and go beyond typological and culture-stratigraphic presentations of lithic fossil-directeurs. Archaeology is becoming increasingly characterized by question-driven research, and the public has the ability and desire to become engaged in these questions. As archaeologists we have the responsibility to demonstrate to the public the diversity of ways that lithic analyses inform archaeologists about human behaviour and culture change.

The “Big Questions” and Lithic Analysis

Our first and foremost responsibility as archaeologists to both the public and the academic community is to conduct good research. Beyond identifying technotypological facies and chrono-stratigraphic changes in lithic frequencies and form, lithic analysis has huge potential for addressing the “big questions” of anthropological investigation. Subsistence and interaction with the environment, landscape use, inter and intragroup interaction, trade and exchange, status and power, initial settlement and time depth, the interaction of people and their
material culture, technological style, social learning, and agency, are just a few among the many research themes that drive lithic analysis in this volume and other publications. The future of lithic analysis relies not just on the application of novel technological developments to knapped stone material, but also to the broader theoretical frameworks that drive our research questions. If we as lithic analysts want to increase our academic and public visibility, then we need to demonstrate the relevance of lithic analysis to current anthropological issues.

Acknowledgements: The organizers would like to thank all the participants for their enthusiastic involvement and for helping make this symposium a successful event. Many thanks to all the undergraduate volunteers for dedicating their time and energy to ensure the symposium went smoothly. We would also like to express our gratitude to Matthew Walls for his feedback and suggestions during both the planning and implementation stages of the symposium. We appreciate the financial support from the Archaeology Centre, the Dean’s Student Initiative Fund, the Graduate Student’s Union, and Anthropology Graduate Student’s Union. Thank you also to Michael Chazan for his encouragement and logistical support.

Author contact information:
Danielle Macdonald
Department of Anthropology
University of Toronto
19 Russell Street
Toronto, Ontario, Canada
M5S 2S2
danielle.macdonald@utoronto.ca