The Southern Cone is a vast and diverse landscape inhabited for millennia by hunter-gatherers. Prehistory in most of this area lacks a trajectory of cultural development that elsewhere in Latin America culminated in complex societies. As a result, the Southern Cone lacks the urban ruins and monumental architecture, the hallmarks of rank and copious pottery assemblages that attract the attention of most archaeologists, domestic and foreign, across Latin America. Instead, its archaeological record is dominated by the sturdy if unglamorous residues of hunter-gatherer societies: stone tools and animal bones. In the popular but misguided imagination, so apparently impoverished a body of evidence offers dim prospects by which to learn about the past. But like other archaeologists who confront the challenge of teasing pattern from sparse material remains, Southern Cone scholars are theoretically informed and methodologically sophisticated. For students of hunter-gatherers and their lithic technology, the Southern Cone is fertile ground populated by growing ranks of talented archaeologists.

France supplies the intellectual roots of much South American archaeology, certainly in the study of hunter-gatherers (e.g., Vilhena-Vialou 2007). French systematics are strongly typological, befitting their own origins in Paleolithic research. In Southern Cone lithic analysis, that influence was conveyed in recent decades through Ascherio (1975) and like-minded archaeologists. As a result, Bordes’ ghost casts a shadow across much South American stone-tool research, in everything from identification of gross form with ideal type to the use of cumulative-frequency charts. In recent decades, South American archaeologists have established links with Anglophone thought, chiefly North American (e.g., Schmidt Dias 2007; sadly, the links are mostly one-way; relatively few North American lithic analysts read the Southern Cone literature seriously). The growing links to the north partly have refocused Southern Cone research upon functional or adaptive, not just typological, concerns. Among other things, this changing focus involves two related and apparently banal but deceptively profound observations that, mystifyingly, continue to elude French systematics: first, that reduction technology was adaptive, not typological, such that members of the very same identity-conscious social group could, often did, reduce similar cobbles in very different ways to produce the same kinds of tools and second, that in the course of use some tools were repeatedly reshaped such that their size and form at discard were much changed from their original size and form.

Thus, archaeology today in the Southern Cone is a fascinating hybrid, part French typology, part American functionalism and its theoretical and methodological apparatus, all informed by uniquely regional concerns and innovation in scholarship (for instance, Southern Cone archaeologists are pioneers in morphometric analysis of stone tools, illustrated partly in the subject of this review). Few places reward the thoughtful student of hunter-gatherer lithic technology more than Argentina, Chile and Uruguay.

Judith Charlin’s Estrategias de Aprovisionamiento y Utilización de las Materias Primas Líticas en el Campo Volcánico Pali Aike (Prov. Santa Cruz, Argentina), BAR International Series 1901 (Oxford, UK, 2009. vii + 251 pp.) exemplifies the hybrid character of Southern Cone archaeology, and illustrates the considerable strengths of recent Argentine scholarship. The book, based on Charlin’s 2007 University of Buenos Aires (UBA) dissertation, concerns time-space patterns of toolstone selection and use among late Holocene foragers of the Pali Aike volcanic district, an inland zone of fairly dense natural toolstone deposits and archaeological sites in southern Patagonia that straddles the Argentine-Chilean border. Charlin registers her appreciation of both the strengths and weaknesses of the French (p. 29) and North American (e.g., pp. 8-19) approaches. The book is not for the faint-hearted; closely reasoned and copiously illustrated, it demands the reader’s full, sustained attention. It also is typical of BAR practice, which densely packs the printed page with text, figures and photographs (its 215 pages of text, excluding appendices and bibliography, include 161 figures and 336 tables). Charlin’s study forms an important part of a larger UBA research project that also includes Barberena’s (2008) recent geoarchaeological work.

Important sources of variation in chipped stone tools include toolstone abundance and working properties, technology of reduction, original design and the size and form that result, type and range of uses, and degree and pattern of resharpening and allometric reduction. Among them, toolstone abundance is perhaps the least studied or perhaps the most naively understood. Its neglect owes to several causes, not least lack of appreciation of its importance and the practical difficulty of estimating toolstone distribution and abundance in natural deposits. The practical difficulty itself is complicated because original sources like chert outcrops and obsidian flows are subject to natural processes like erosion and glaciation that create secondary toolstone distributions that are more diffuse, discontinuous andpatchier. As a result, a toolstone’s distribution can be highly complex, and its source locations themselves can vary in number, size or condition of nodules, all of which bear upon the value that toolstone had to prehistoric consumers.

Owing largely to the practical difficulties that the study of toolstone engages, we archaeologists tend to gloss the importance of toolstone distribution. When, like Charlin, we study and interpret lithic assemblages distributed across broad areas for patterns in the use of stone tools, we tend to emphasize the importance of reduction technology, tool design and use, and degree of resharpening and curation. There is no doubting the importance of those sources of variation, but by circumstance our traditional emphases neglect the importance of toolstone and its salient properties.

Like most archaeologists, Charlin understands that evidence for toolstone distribution does not speak clearly but must be interpreted. The simplest and most naïve view is to equate the distance that toolstones are found from their sources with the land-use scale (crudely if inaccurately “mobility”) of the people who used them. In North America, this view was challenged first by Binford’s (1979) concept of “embedded” procurement (people acquiring and using toolstone as they followed their annual rounds, not making specific trips to sources). The debate that ensued generated much heat and some light, but never was resolved. Yet along the way Ingbar (1994) showed hypothetically that embeddedness could lead archaeologists to misapprehend the scale and organization of hunter-gatherer land use. Still, the question of inferring land-use scale from the abundance and distribution of toolstone is hampered by both the scarcity of empirical data and the equifinality (different causes producing the same results) that plagues efforts like Charlin’s (and others, e.g., Meltzer 1989) to disentangle the effects of distinct causes. Charlin is aware of this vexing problem (e.g., p. 16) and somewhat engages with it. For instance, her predictions for toolstone procurement in two successive late Holocene intervals (p. 124) are robust -greater versus lesser “intensity of use”- but not precise or unambiguous. Nor is she entirely persuasive in arguing that equifinality is a greater problem at the site level than at her regional level. This is less a criticism of Charlin or predecessors than acknowledgment of the daunting interpretive challenge. More recently, Brantingham’s (2003) neutral model proposed a null hypothesis of random movement and strictly embedded toolstone procurement. However faithful or not are Brantingham’s assumptions to prehistoric behavior, the point is that different models of procurement are difficult to distinguish in the time-averaged archaeological record. Charlin understands this (e.g., pp. 14-15), but does not entirely persuade in her efforts to discount the neutral model.

On balance, however, Charlin is at least as successful as other archaeologists in struggling with and at times overcoming the ambiguities of equifinality. Her breadth and most significant contribution is at once methodological and substantive. First, her research design explicitly
emphasizes the need to gauge the distribution, abundance and quality of toolstone materials over large areas. Chapter IV describes the systematic approach to source areas, including timed collection of source locations, as well as Charlin’s protocol for analysis of raw-material cobbles, which recognized node length, shape, colour, and roundness. My only criticism of her methodology is that Charlin scants the details of the design of her regional survey, including whether source areas were located via systematic, probabilistic sampling or by more casual search. Second, Charlin’s analysis demonstrates how toolstone abundance and distribution can be reduced to measurable patterns that allow her to attribute a significant degree of patterning in her lithic assemblages to toolstone supply. Third, she synthesizes geological and environmental research to conclude that effective abundance and distribution of toolstone vary seasonally, depending on ground cover, degree of deflation or weathering of the surface, and other factors. Like pine nuts and marine mammals, toolstone is a resource subject to seasonal patterns of variation. In a highly original argument, Charlin projects modern seasonal variation into temporal variation that she correlates with long-term climatic variation in the Pali Aike region (pp. 112–117), which she then tests and mostly supports against the evidence (pp. 201–203).

In sum, Charlin presents both a workable method and theory for the analysis of toolstone distribution and abundance that archaeologists can and should apply widely (it certainly will inform my continuing research on obsidian procurement in the prehistoric Great Basin of North America). In this respect, her work represents the logical extension of a recent tradition of research, principally by Argentine scholars (e.g., Franco and Borrero 1999) that places fresh emphasis upon toolstone abundance and distribution.

Charlin’s study is of ambitiously broad geographic scale. It is the rare archaeological study that systematically surveys fairly large areas for the distribution, abundance and quality of major toolstones. Across the Pali Aike landscape, the principal toolstones used are RGFO (“rocas de grano fino oscuras” [dark, fine-grained stone]), cherts (particularly chalcedony) and dacite. Yet many other toolstones, including obsidian, occur in small quantities, yielding a highly diverse material repertoire for the region. Comparing natural and archaeological abundance, Charlin can determine the degree of selection exercised by prehistoric tool users; for instance, chalcedony is only tenth among toolstones in natural abundance but third in use (pp. 102–104), and basalt is fairly abundant in the Pali Aike landscape but was little used by ancient Patagonians (p. 71). One reservation: RGFO, the single most common and arguably most important toolstone, is a default descriptive category that encompasses considerable variation in toolstone size, quality, abundance and distribution.

Charlin’s analysis is systematic and remarkably thorough. She devotes separate, lengthy chapters (IX and X, respectively) to lithic data from surface surveys and excavations. Both are organized around constructed units of time and space, although chronological control is much better, therefore more thoroughly explored, in excavation data. In the latter, the chronological range spanned is approximately 4,300–1,000 B.C.E. Results reveal both synchronous spatial patterning in the procurement and use of toolstone and diachronic variation in these practices. Especially in surface data, cherts and RGFO are most widely distributed, often are reduced using bipolar methods (a response to the small size of raw nodules), and used preferentially to make bifaces, whereas dacite serves more often to make flake tools. Chert and RGFO generally are more multifunctional and apparently more extensively reduced than are other toolstones.

Although the study’s geographical scope is impressive in view of the logistic challenges involved, it nevertheless documents the acquisition and distribution of toolstones over comparatively modest scales. Trivially, it is impossible to document toolstone distribution that exceeds a study area’s size. Yet the scale of distribution in some of the ethnographic sources cited (e.g., Gould and Sagers 1985) slightly exceeds Pali Aike’s scale, and late Pleistocene toolstone distributions in North America (e.g., Meltzer 1989) and the Southern Cone (e.g., Flegenheimer et al. 2003; Franco 2004; Suárez et al. 2009) exceed it by considerable margins. This is not to criticize Charlin’s choice of geographic scale, but to acknowledge that it is not as broad as were the land-use practices and scale of some hunter-gatherers. A worthwhile exercise would be to infer Patagonian hunter-gatherer land-use scale from cross-cultural data on joint social and environmental determinants (e.g., Binford 2001) to gauge how well Charlin’s scale compares with resulting estimates.

As much as any recent work, Charlin’s book demonstrates the centrality of reduction and its measurement to virtually the entire range of lithic analysis. This importance is manifested in the book’s concern to measure degree and (to a lesser extent) pattern of resharpening in cores, flake tools and formal tools. At the same time, the book faithfully reflects the uncertain grasp of the curation concept (as the ratio of realized to potential utility, sensu Shott 1996) in reduction analysis.

One modest shortcoming of Estrategias de Aprovisionamiento... is Charlin’s use of only few and limited measures of reduction, especially in unifaces and other flake tools. Even this limitation is understandable; research on reduction measures is among the fast-moving areas of lithic analysis, and much has been learned since Charlin’s study was completed several years ago. Charlin relies heavily upon Kuhn’s (1990) “Geometric Index of Unifacial Reduction” (GIUR), championed passionately by Australian archaeologists but also used elsewhere (e.g., Andrésky 2008, and chapters therein). Much heat and some light have issued from recent debates about GIUR. It is a geometric reduction measure that assumes triangular cross-section in flakes, and retouch along the sides but not the ends of the flake. As valid as the measure is, and subject to its limiting assumptions, GIUR is a, not the, measure of flake reduction (Shott 2005). Until recent experiments and the claims based on them are documented much more thoroughly, GIUR has not -cannot- refute the “flat-flake” problem (i.e., opposing faces that are subparallel for most of their length such that flake cross-sections are trapezoidal). Nor does it obviously apply to the hafted endscrapers so common in many parts of the world, including South America.

Besides GIUR, legitimate measures of flake reduction include invasiveness indices (e.g., Clarkson 2002) and simple allometric ratios like length:thickness (e.g., Shott and Weedman 2007). Charlin also uses simple “residual length”, especially of flake tools, as a reduction measure. Length is a crude measure that compounds many causes (cf. p. 35’s acknowledgment that it cannot measure length and therefore utility lost or its argument that residual length reflects “las decisiones de cuándo abandonar y/o reemplazar el instrumento”). Thus, the greater residual length in dacite versus chert or RGFO tools from excavated contexts (p. 178), for instance, may not reflect lower reduction and curation so much as longer original flake length especially since, as Charlin notes elsewhere, dacite was reduced mostly by freehand percussion of fairly large cobbles while chert and RGFO often were fashioned by bipolar reduction, presumably of small nodules. What is more, the GIUR that Charlin finds for flake tools varies purely with reduction in width or cross-section. As Charlin notes elsewhere, dacite was reduced mostly by freehand percussion of fairly large cobbles while chert and RGFO were reduced using bipolar methods (a response to the small size of raw nodules), and used preferentially to make bifaces, whereas dacite serves more often to make flake tools. Chert and RGFO generally are more multifunctional and apparently more extensively reduced than are other toolstones.

Owing to their lower abundance in the Pali Aike landscape, points (cabezales) and other bifaces figure less prominently in Charlin’s research. For these tools, Charlin uses the allometric ratio thickness:length pioneered by Iriarte (1995) and only later developed elsewhere (Shott et al. 2007). Again, invasiveness indices (e.g., Andrésky 2006) and allometric ratios (e.g., Shott and Ballenger 2007) also can be applied to bifaces, as can the outline methods illustrated by Suárez (2004) for Uruguayan Colas de Pescado. So can two-dimensional allometric measures (e.g., Buchanan 2006; Eren and Pendergast 2008); I am currently experimenting with three-dimensional imaging for the development of further reduction measures that exploit the whole-object geometry of stone tools in ways that ratios of few orthogonal dimensions cannot. As Charlin continues her Patagonian research, and as others follow her lead there and elsewhere, they should consider a full range of tool-reduction measures.
The evidence against which Charlin tests her expectations comes from Pali Aike lithic assemblages. She makes some use of standard summary measures of assemblage structure like richness and diversity/heterogeneity (p. 33). This is reasonable, but in practice Charlin does not always take account of the pervasive size-dependence that resides in such measures, and that contributes to the value of assemblage measures independently of the behavioral factors that interest her. In fairness to Charlin, neither do most archaeologists. Size-dependence itself owes to assemblage formation processes that can be quite informative about the prehistoric behavior that generated the assemblages (e.g., Shott 2010).

Although most archaeologists, including Charlin (e.g., p. 13), have moved beyond the curateness:expediency dichotomy in most respects, they continue to rely on lature rates as “expediency”, much as we might reduce the ratio variable height to opposing classes of “shortness” and “tallness”. Some, Charlin prominent among them, have begun to not merely observe or invoke curaten but to measure it as the quite-scale variable that it is (Shott 1996), using the reduction measures noted above. Even in this respect, however, Charlin and others do not exploit the full potential of curation and reduction analysis. Beyond descriptive statistics of degree of reduction/curation or inferential statistics of degree and significance of difference in measures, archaeologists must learn to use reduction and curation as powerful analytical tools. For instance, Charlin uses density of retouched tools, especially in excavated deposits, as a measure of occupational and tool-use intensity. This logic is reasonable so far as it goes, but it should be extended by adjusting raw density by degree of reduction experienced by the tools under study. Thus, a raw density of, say, 100/m² for tools only half-reduced on average is not equal to the same density for tools that are almost completely reduced on average; a half-used tool does not represent an equal amount of use as a fully used one. Also, archaeologists must treat reduction and curation as paleodemographers treat skeletal age: as an interval-scale diagnostic variable that not only reveals patterns but implicates causes of aging, attrition or discard. We must compile the reduction distributions that, via biological and engineering theory, they then can explain as the product of different kinds (e.g., gradual attrition vs. catastrophic failure) or degrees (e.g., via interpretation of Gompertz-Makeham parameter estimates). My own work (Shott 2010; Shott and Sillitoe 2005) illustrates the approach and some of its considerable analytical potential. Charlin and like-minded archaeologists might consider undertaking such analyses. Doing so would only improve the already-high quality of hers and other recent Southern Cone research.

Quibbles aside, Charlin’s book is exceptional in important analytical respects. First, she makes thorough, intelligent use of one measure of reduction or use insufficiently appreciated by most lithic analysts, at least in the north: degree of exterior-surface faceting in lithic debris (“densidad de negativos de lascado”, p. 33). This measure not only draws debris into the scope of analysis, but experimental studies document the measure’s correlation with degree of modification and/or reduction (e.g., Bradbury and Carr 1999). Yet few empirical studies have used degree of faceting to the good effect that Charlin demonstrates here (e.g., pp. 138-140, where it clearly patterns with toolstone source and distance in surface assemblages).

Second, Charlin presents highly original results in the morphometric analysis of point outline form on notch and shoulder, and of cross-section (e.g., pp. 182-185), which hold considerable promise as general reduction measures (yet subject to limitations of their own). For instance, Charlin reserves one trait - outline form of notch into two components: ratio of base edge-length to shoulder/notch edge-length, which she considers a design element largely immune to allometric reduction effects, and angle formed between base edge and shoulder, which she links to reduction by resharpening. Although her reasoning might be questioned (e.g., length of shoulders/notches can itself decline with reduction), her analysis illustrates the value of highly detailed resolution of morphological traits as well as morphometric analysis of those traits. Because these or similar traits inform well-known classification schemes in the north (e.g., Thomas 1981), they deserve serious consideration in future classification studies here. In this respect, Charlin’s work exemplifies broader trends in pioneering morphometric research that distinguish Argentina as a center of highly original thought and research (e.g., Cardillo 2005; Cardillo and Charlin 2008; Castiñeira 2008).

On balance, Estrategias de Aprovisionamiento... is the most thoughtful and thorough recent approach to the problem of toolstone abundance and distribution and their influence upon stone-tool assemblages. Its value is far more than merely documenting some empirical patterns in the later prehistory of Patagonia. Instead, its chief value is the study’s combination of ambitious scope, clear theoretical focus and methodological rigor, and nuanced but grounded interpretation of complex patterns of evidence. Its length and detail challenge; its analytical approach is comprehensive even if it sometimes inspires reservation; but its overall effect is to both persuade about the broad outlines of the patterns described and explained and to inspire optimism about one of archaeology’s enduring challenges, viz. its ability ultimately to take account of toolstone distribution and abundance in comprehensive analysis of lithic assemblages.

Southern Cone archaeologists engage with the North American archaeological literature, but for the most part we northerners do not reciprocate. Language is one obvious obstacle. To make more balanced the patterns of communication between Americas north and south we might consider more literature reviews (e.g., Borroerro 1999; Scheinsohn 2003) that at least make syntheses of southern research known to the north. But we also should consider translation of Southern Cone publications selected for their particular merit. Then northerners could benefit from southern thought and research as southerners do today from the north. This effort would give northerners access to the finest of recent Southern Cone scholarship, of which Charlin’s book is a splendid example.

REFERENCES CITED

Andrefsky, W.

Andrefsky, W. (editor)

Aschero, C.

Barberena, R.

Binford, L. R.

Bradbury, A. P. and P. J. Carr

Brantingham, P. J.


Ingbar, E.

Iriarte, J.

Kuhn, S. L.

Meltzer, D. J.

Scheinsohn, V.

Schmidt Dias, A.

Shott, M. J.

Shott, M. J. and J. Ballenger

Shott, M. J. and P. Sillitoe

Shott, M. J. and K. Weedman

Suárez, R.

Suárez, R., N. Batalla, M. Muttoni, and R. Detomasi
2009 Accesibilidad y Traslado de Ágata Traslúcida en Contextos Arqueológicos Tempranos del Norte de Uruguay. Ms. on file, Museo Nacional de Historia Natural y Antropología, Montevideo, Uruguay.

Thomas, D.

Vilhena-Vialou, Á.