serve, notebook and pencil, rather stupidly in my hand; I did not dare leave, in spite of the heat, the mosquitoes and my own hunger." With the author's reflections on his research and his feelings, the reader can easily see the dynamic intersection between the scientist and the objects of his study and follow how these relations changed through time. Thoughts and emotions, experiences and ideas, happiness and sadness, are all brought together in sharp focus in this account of the traditional Guayaki world. Today the Atchei Gatu and Iroiangi have vanished, as Clastres anticipated. And the world of the surviving Guayaki is quite different, as they have lost much of their culture and traditional knowledge. At least, however, their spirit still survives in Clastres's *Chronicle*.

References

1. Published in France as *Chronique des indiens Guayaki* (Librairie Plon, Paris, 1972).

NEW MEDIA: MULTIMEDIA

Making Multimedia

Hamid Ghanadan

Traditional film techniques, relying on hand-drawn animation for illustrating scientific principles, are expensive, laborious, and noninteractive. Modern multimedia presentations for viewing on personal computers and electronic displays, however, are relatively easy to create and are effective in communicating scientific information.

Multimedia presentations are assembled from various elements, such as two-dimensional (2D) static images (for example, charts, graphs, and still pictures), computer-generated three-dimensional (3D) structures, sound, and video. 2D images can be created with standard graphic or plotting software on personal computers (including built-in charting routines that come with spreadsheets, for instance) and then converted to any of several popular image file formats, including TIFF, PICT, JPG, or GIF.

3D molecular structures can be prepared in two ways. First, one can design the object's frame (shape) from scratch and give it an appropriate surface texture in 3D rendering programs such as Lightwave 3D, Ray Dream Studio, or Strata Studio Pro. The basics of 3D modeling can be relatively easily mastered. Realistic 3D scenes containing shadows and depth of field are much more difficult to create. They require both technical and artistic skills beyond the abilities of a novice. Alternatively, objects for which the 3D coordinates are known, such as molecular structures in Protein Data Bank (PDB) format, can sometimes be imported into 3D rendering software for creating animations.

It should be noted that the common 3D file format called DXF is poorly standardized and that not all DXF files are compatible with all programs. For example, none of the three popular programs mentioned above can open DXF files created by the popular MolView program, which reads PDB files. Worse, 3D rendering programs cannot directly read PDB files either. Converting PDB files into a suitable DXF format is, unfortunately, difficult and indirect. Such conversions can most readily be made by employing two applications: the free Linux program called Medit (http://sunsite.unc.edu/pub/Linux/apps/editors/X/medit-1.7.1.lsm) and the commercially available UNIX application called Ribbons. The resulting files may then be exported to the 3D rendering program of choice.

Audio for presentations can be captured from virtually any source (including a cassette recording) through a computer's audio input interfaces: the microphone jack, the RCA-style input jacks, or the CD-ROM drive. Macromedia SoundEdit 16 is a popular software package for editing sound files and converting them into common multimedia file formats, such as WAV, AIFF, and QuickTime. Video from videotape can be imported in a similar manner, if one has an AV-equipped personal computer with video input jacks. Programs like Adobe Premier and Adobe After Effects allow one to capture, edit, and stylize (apply effects to) digital video.

Authoring software, such as Macromedia Director, provides a way to bring the various elements together onto a "stage" for assembling the finished presentation, which may range from a simple movie to a complex, multicomponent presentation that responds to user actions. It is at this point that the choice of an appropriate file format is critical. If the presentation is a simple movie or audio presentation (such as a lecture), formats such as Real Audio/Real Video offer nice cross-platform solutions viewable on Web browsers. If interactivity is desired, ShockWave, QuickTime, or Macromedia Director formats work best. Interactivity requires an integrated programming language, such as Lingo (which is built into Macromedia Director) or the QuickTime Media Layer (QTML). Each language provides conditional responses to user actions and a way to define relationships between the elements. The finished product can be platform-dependent (that is, a Macromedia Director movie specific for Mac or Windows) or platform-independent, if it is output in a format such as QuickTime or ShockWave. Platform-dependent presentations are self-running and are usually distributed on CD-ROM. They offer the advantage of being free of browser considerations and optimized for a particular system. The downside, of course, is that codes must be prepared separately for each platform. ShockWave- or QuickTime-formatted presentations, on the other hand, are platform independent and require a ShockWave- or QuickTime-equipped browser, like Netscape Navigator or Microsoft Internet Explorer. The finished presentation has the advantage, however, that it can be delivered either on fixed storage media like CD-ROM or through the Web.

The author is with gh multimedia, Bend, OR 97701, USA. E-mail: hamid@ghmedia.com

VIGNETTE

Scientific Reformation

It has been argued that when Europe was united as 'Christendom,' contradictory elements of Church doctrine—such as the idea that the One True God consists of 'three persons'—were neutralized in practices that stressed different elements on different occasions. However, with secularization came the elimination of many of these buffering practices, which in turn served to make the doctrinal contradictions appear stark and irresolvable. Similarly, if the end of state funding for science were to end the perception of a unified conception of science, the fact that the physical, life, and social sciences operate with fundamentally different aims and orientations would perhaps rise to the surface to become a point of public contention. In any case, the public already seems to have an instinctively clearer sense of such cross-disciplinary differences than practising scientists who, despite their clear theoretical and methodological differences, continue to talk in terms of a 'Science' common to them all. Indeed, what scientists often see as the public's 'confusion' about the nature of science may simply be the public's recognition that there is no 'nature' to science.

—**Steve Fuller**
in *Science*
(University of Minnesota Press/Open University Press, 1997)