course. This is just Winston's way of telling the reader that conventional stories of the evolution of information focus too narrowly on a single inventive moment. He corrects this with a study of the prehistory and posthistory of the inventions. The historical accounts are assembled from secondary sources, sometimes indiscriminately. For example, one's confidence in Winston as historian is shaken early on when he states incorrectly that electronics theory and technology changed little between 1907 and 1923, and later when he relies on a superficial treatment of industrial research to buttress his conclusion about innovation in industry. But in between the history is usually both accurate and enlightening. The book contains a good explanation of how electronics-based television overtook mechanical scanning disk systems; a good international perspective on the history of television, computers, and communications satellites; excellent discussions of the evolution of cable television and of videotape recording as compared to its rivals. It also includes numerous digressions. Sometimes the quantity of information does not illuminate but instead befogs.

But a message well worth receiving burns through the fog. Today's new information technologies (personal computers, cable television, communications satellites, fiber optics, videocassette recorders), like yesterday's (telegraphs, telephones, radio, television), do not appear overnight and then radically transform society. Instead they appear after plenty of advance warning, emerge when society is ready for them, and then accommodate themselves to existing institutions. From this general thesis, Winston derives 20 courageously specific predictions. For example: "Entertainment channels, whether delivered by cable or other means, will probably never exceed one dozen" (p. 2).

But why believe the general thesis? Because, Winston tells us, innovation always follows a sequence of predictable phases, driven by two laws. "The law of supervening necessity" states that social readiness, not technological readiness, determines the pace of innovation. One expects "the law of the suppression of radical potential" to tell of a capitalist plot to suppress technology-for-the-people but gets instead the unsurprising news that established interests try to envelop and control challenging new technologies. Sometimes they succeed. The radio networks dominated television; the electromechanical tabulating machine company IBM dominated computers. Sometimes they fail. Western Union did not dominate telephony; the vacuum tube giants RCA, GE, and Raytheon did not dominate solid-state electronics.

Winston fits the history of eight information-related technologies to his model. In the process he gathers into one place a broader account of the history of these technologies than will be found elsewhere. His purpose, however, is not history for its own sake but validation of his model.

It is hard to see how any invention would fail to fit the model. "Supervening necessity" appears to be no more than whatever preceded invention. "Radical potential" appears to be anything that did not follow invention. Thus radio broadcasting, by most standards a radical innovation, is implicitly dismissed by Winston as non-radical because it happened.

More defensible than Winston's exercise in model-based prediction are the more general conclusions he draws from recent history. The amount of information in the world is not growing exponentially; the pace of technological change is not speeding up dramatically; the independent inventor is not obsolete. Historians will both welcome these conclusions and recognize them as a confirmation of the ones reached by Jewkes, Sawers, and Stillerman in their classic *The Sources of Invention* 30 years ago. Since then, books about future shock, information revolutions, and wired societies have rolled steadily off the presses. Some people have apparently not gotten the word that most alleged discontinuities in society's use of technology are more hype than fact. Perhaps this energetically expressed formulation will get that word to them.

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Metamorphic Rocks

Blueschists and Eclogites. BERNARD W. EVANS and EDWIN H. BROWN, Eds. The Geological Society of America, Boulder, CO, 1986. viii, 423 pp., illus. $55. GSA Memoir 164. Based on a conference, Bellingham, WA, Sept. 1983.

This collection of 28 papers deals with the petrology of relatively high-pressure–low-temperature rocks generally thought to form in convergent plate junctions. In aggregate, it provides an overview of the origin and tectonic evolution of such lithologies worldwide. Up-to-date reports of research on mineral reactions, thermodynamic analyses of phase assemblages, and descriptions of particularly illuminating circum-Pacific and Alpine high-pressure occurrences are thoroughly documented. The first three papers detail experimentally determined and thermodynamically computed phase relations. The rest contribute data on natural occurrences from western North America (ten papers), Europe and the Mediterranean (nine papers), the U.S.S.R. (one paper), Japan (four papers), and New Caledonia (one paper).

Synthesis of sodic amphibole-bearing assemblages in iron-free and iron-containing model systems provide new quantitative P-T-f_{O_2} constraints for the greenschist $\rightleftarrows$ blueschist facies transition (Maruyama *et al.*); the Al_2O_3 content of blue amphibole in the low-variance assemblage glaucophane, epidote, actinolite, chlorite, albite, and quartz may be utilized as a geobarometer in the 4- to 8-kbar range. Much higher pressure assemblages—approaching 25 kbar—appear to be required by experimentally synthesized phases such as ellenbergerite, pyrope, coesite, magnesium-carpholite and magnesium-chloritoid, which have rare natural analogs in aluminous rocks of the western Alps (Chopin); this discovery testifies to the remarkable depths evidently reached by supracrustal rocks during subduction accompanying consumption of Mesozoic Tethys. Generally landward-rooting thrust and/or strike-slip fault systems, involvement of oceanic tholeiite (with or without alkali basalt), and late Triassic to latest Cretaceous metamorphic ages (Mattinson; Armstrong *et al.*) characterize preserved glaucophane schist assemblages in the western North American cordillera. Fragments of this convergent history are preserved in telescoped lithologic sections (Moore; Sorensen; Cloos; Jayko *et al.*; Helper; Brown; Brown and Forbes; Roeske). Plate tectonic settings, protoliths, mineral parageneses, and ages of recrystallization of early Paleozoic blueschists and related rocks from scattered localities in northern and western Europe are documented (Ohta *et al.*; Gibbons and Gyopari; Peucat). The parageneses and structural relations of late Cretaceous–earliest Cenozoic high-pressure–low-temperature mafic blueschists, eclogites, and associated metasediments in the Alpine-Tethyan realm are summarized for the western Alps (Oberhänsli; Dal Piaz and Lombardo; Mottana), Corsica (Gibbons *et al.*; Warburton), and Turkey (Okay). Of particular significance is evidence summarized by Dal Piaz and Lombardo for recurrent or continuous generation of high-pressure–low-temperature mineral assemblages over the interval 130 to 60 million years ago, an age span similar to those of blueschist-eclogite assemblages from California, Washington, Alaska, and Japan. Participation of preexisting continental crust in the subduction metamorphism is characteristic of circum-Tethyan orogenic belts, in contrast to dominantly oceanic basement caught up in circum-Pacific blue-

schist-eclogite zones. Unlike most Phanerozoic (dominantly Mesozoic) high-pressure belts, eclogitic pods and complexes in a variety of Siberian, Uralian, and Mongolian orogenic zones of the U.S.S.R. have late Proterozoic or mid-Paleozoic crystallization ages (Soblev *et al.*), as indicated by geologic relationships and rubidium-strontium and uranium-lead radiometric dating. Some Russian eclogites are associated with ultramafic diapirs and may represent deep upper-mantle fragments, whereas others reflect high - pressure – intermediate - temperature conditions appropriate to basal portions of thick continental crust (see also Newton); still others occur as clasts in olistostromes, as extensive tracts of glaucophane schist, and as ophiolite-decorated suture zones. Overviews and details of recrystallization and contemporaneous deformation in Phanerozoic Japan—type-locality for paired metamorphic belts—are presented (Banno; Kunugiza *et al.*; Toriumi and Masui; Maekawa). Owing to post-convergence terrane reshuffling, some of the original pairings have been obliterated. The final chapter (Yokayama *et al.*) summarizes mid-Tertiary blueschist-eclogite facies metamorphism in New Caledonia and documents the mineral parageneses, spacing, and shallow dips of isogradic surfaces, as well as an apparent increase in thermal gradient in the more intensely recrystallized rocks. According to these authors, geologic data are not in accord with profound burial; hence pressures exceeding 10 kbar required by mineral thermobarometry are postulated to reflect tectonic overpressures at relatively shallow crustal levels.

This memoir brings together for the first time integrated, modern observational, theoretical, and laboratory data bearing on this tectonically significant suite of rocks. Impressive because of their near ubiquity are the described association of high-pressure–low-temperature mineral assemblages with oceanic crust and deep-sea sediments, serpentinized mantle material, imbricate thrust belts, and tectonic melanges and the virtual confinement of these provocative features to Phanerozoic convergent plate junctions. Protoliths are extremely variable in composition, and pressures of metamorphism evidently ranged from approximately 4 to 25 kbar. The compendium has been meticulously edited and is abundantly illustrated but lacks a subject index. It is required reading for metamorphic petrologists and tectonicians and will be useful for many years to come.

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Memory Systems

Synapses, Circuits, and the Beginnings of Memory. GARY LYNCH with commentaries by GORDON M. SHEPHERD, IRA B. BLACK, and HERBERT P. KILLACKEY. MIT Press, Cambridge, MA, 1986. xii, 124 pp., illus. $22.50. The Cognitive Neuroscience Institute Monograph Series. A Bradford Book.

In this interesting monograph Gary Lynch, one of the most innovative and productive researchers on the neurobiology of memory, sets forth his ideas on the cellular mechanisms that underlie memory in the brain and the network of neurons that participate in memory storage. Though the book can be criticized for its selective presentation of data and its brief or nonexistent treatment of alternative ideas, it offers a valuable glimpse into the reasoning of an active scientist who is attempting to make sense of an array of incomplete and often inconsistent data.

Though written for a general neuroscience audience, the book assumes familiarity with long-term potentiation (LTP) and central nervous system anatomy. After a flawed introduction by Michael Gazzaniga, in which the development of the brain-slice technique and the discovery of LTP are incorrectly attributed to Lynch, Lynch briefly describes his theory of LTP, according to which glutamate receptors are unmasked through the action of Ca^{2+} on the fodrin-degrading enzyme calpain. However, little of the book is devoted to the extensive work of Lynch and his colleagues on LTP and the LTP correlates of calpain-fodrin manipulations. Rather, in a surprising departure from his past focus on the hippocampus, Lynch introduces the olfactory system as a model for studying the associative interconnections, termed combinatorial circuits, widely thought to be required for memory and cognitive systems.

The olfactory system was chosen as a model because of its unusually clear combinatorial neuronal architecture. Lynch's emphasis on combinatorial systems and the specific features of the olfactory system provides an intriguing alternative to topographic theories that concern cerebellum–brainstem and hippocampus–neocortex, among other systems. Although he implicitly contrasts the combinatorial and topographic approaches, Lynch gives little consideration to topographic ideas and none to conceptual similarities between topographic and combinatorial memory theories. Notwithstanding his statement that the olfactory modality "has direct and well-defined connections with subcortical structures that play a prominent role in human memory" (p. 3), there are many differences between olfactory learning and memory and more commonly studied systems. The validity of the approach, as always, will depend on the ability of the model to provide insight into brain processes in memory. The book is sure to generate controversy (at one point Lynch writes, "It seems unlikely that behavioral pharmacology can be used satisfactorily to test hypotheses about memory") and to stimulate new thought and experiments.

The book closes with three papers described as commentaries. Gordon Shepherd presents a fascinating analysis of the possible role of dendritic spines in plasticity, showing by means of computer modeling the interactions between adjacent spines. Ira Black describes recent findings of the flexibility of transmitter systems and provides a needed contrast to Lynch's emphasis on postsynaptic processes. Herbert Killackey reviews the conference that spawned this book and discusses the role of neocortical anatomy in focusing ideas about the brain's memory systems. These are not strictly commentaries, as they go beyond Lynch's theses, but they are well worth reading in their own right.

As with many theories in their early stages, there are holes and inconsistencies in Lynch's work. Yet it is a testimony both to Lynch and to the rapid advances in the study of brain substrates of memory that such ideas can be seriously advocated and considered.

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Comparative Ecology

Ecology and Natural History of Desert Lizards. Analyses of the Ecological Niche and Community Structure. ERIC R. PIANKA. Princeton University Press, Princeton, NJ, 1986. xii, 209 pp., illus., + plates. $45; paper, $19.95.

Lizards have been touted as model organisms in ecology, and Eric Pianka's efforts have played a major role in focusing the attention of ecologists on these fascinating animals. In addition, Pianka's detailed quantitative observations on resource partitioning in assemblages of lizards have become paradigmatic of an entire approach to community ecology. Thus this monograph, an overview and synthesis of Pianka's empirical work, will be greeted with interest.

The monograph is organized through the descriptive comparison of lizard communities in three desert ecosystems. The Great Victoria desert in Australia, the Kalahari semi-desert of Africa, and the Great Basin–