Stephen Pinker and Michael Ullman argues against the connectionist theory (especially the Rumelhart-McClelland model, RRM) and theories of generative phonology, and proposes the Word and Rules (WR) theory of past tense storage. Different from connectionist theories which argue for a single pattern associator that generate both regular and irregular past-tense forms based on phonological features, WR theory argues that irregular past-tense forms are explicitly stored in the lexical portion of our declarative memory, while regular past-tense forms (adding the suffix “-ed”) can be computed in the grammatical portion of our procedural system.

Stephen Pinker and Michael Ullman provide empirical evidence from three lines of research. (1) Generalization to unusual novel words: People in real life apply regular inflections to novel usual words, implying that the grammatical system is at work when there is no existing past-tense form explicitly stored in the lexical system, which is compatible with WR theory; but on the contrarily, connectionist models produces odd blends or no output in this type of situation. (2) Systematic regularization: some irregular verbs, such as headless (exocentric) words, can show up in the regular form in certain contexts. This cannot be explained by sound-based connectionist models because, in whatever contexts, the sound of the same word is the same and therefore their past-tense forms cannot differ, which is different from the empirical data; but WR theory is still compatible with these situations since the lexical system and grammatical system are independent of each other, and if the lexical system (which retrieves the irregular form) is blocked, the grammatical system (which applies the “-ed” suffixation rule can take effect and generate the regular form for these normally-irregular verbs in certain contexts. (3) Neuropsychological double dissociations: Patients with certain impairments in their brains have trouble with either regular or irregular words but not the other, while patients with other brain impairments experiences the contrary pattern of capacity impairment. For example, Alzheimer's patients have greater impairment of lexical knowledge than of cognitive skills, thus they more trouble with irregular words and produce over-regularization errors. On the contrary, Parkinson’s disease patients have greater impairment of cognitive skills and thus experience more trouble with producing regular past-tense forms.

James McClelland and Karalyn Patterson offer a rebuttal of WR theory and argue for an integrated connectionist network that maps from the stem of all verbs to their past-tense forms using a single network of units and connections. They mention that the WR theory is in fact not a “word and rule” theory as Stephen Pinker and Michael Ullman have claimed, but a “word or rule” theory that ignores the possible associations between regular form and irregular forms. However, the existence of quasi-regularity and many shared properties between regular and irregular forms shows that there is also regular in the “irregular;” but as the WR theory thinks that irregular forms are only case-by-case memory storage for single words, it is not possible to explain this “regular in the irregular” phenomenon.

I agree more with the connectionist view. First of all, Stephen Pinker and Michael Ullman seem to be using a strawman argument against the connectionist view. Not all connectionist models are based on sounds, and therefore, many of the problems Stephen Pinker and Michael Ullman mentioned concerning connectionist models in fact do not exist. Connectionist models can also take into account contextual information; an example of this would be the Interactive Activation and competition (IAC) Model. I am also against completely separating the “word” and “rule” systems for the same reason. Not only does the WR theory have trouble explaining the quasi-regularity phenomenon, it does not explain convincingly our tendency to map existing irregular forms onto novel irregular-looking verbs as well. The WR theory treats this phenomenon as an “analogization” process; but in the first place, if there is no representation of any rule at all for these commonly-appearing irregular forms and every irregular verb is an independent data point, how would we ever know that the novel word we encounter can be mapped onto a certain type of existing irregular form? Shall we search the whole lexicon before arriving at a decision? I think a combination of lexical representation for irregular forms and a rule-based system that covers both regular and irregular forms would make more sense.