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Abstracts of the Marschak Colloquium at UCLA

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This colloquium addresses a number of issues in the realm of attention that range from quite abstract logical principles to the specific mechanisms of human spatial attention. The plan is to illustrate the kinds of reasoning and the paradigms that have been used to derive what we know about attention without getting bogged down in the details, most of which are available in publications (see references below).

1. The concept of an attention operating characteristic (AOC) is shown to arise naturally from attention experiments. It is demonstrated how the AOC is equivalent to, for example, a Production Possibility Frontier in macroeconomics and to a Receiver Operating Characteristic in psychological signal detection theory. A formally equivalent optimization theory encompasses a broad range of phenomena, and each of the subdisciplines in which it has evolved, has developed something unique to offer the others.
2. A simple formal specification of various tasks that have been used to assess attention (to derive AOCs) is presented. It turns out that the interpretation of the most common types of attentional experiments depends critically on ideal observer models. That even an ideal observer exhibits an attentional operating characteristic is an often neglected component of attentional limitations is illustrated.
3. A priori, the dynamics of visual attention (e.g., a shift of attention from one location to another) could have been described in terms of either continuous or discrete models. Both descriptions are formally equivalent to "spotlight" analogs. However, a particular discrete form of this spotlight model, an "episodic theory of attention" is shown to give a better account of the major data sets that previously had been asserted to support quanta1 theories, and the episodic theory is demonstrated to be in agreement with data obtained from five major classes of attentional paradigms.
4. A general neural mechanism for attention is proposed to account fo the apparently similar dynamics of obviously different attentional processes.
5. A remarkable experimental outcome involving attentionally-generated apparent motion is used to gain special insight into the process of allocating spatial attention. It appears that an attentional mechanism whose spatial and temporal dynamics are easily measured in the context of apparent motion experiments (a "salience map") is in fact the same mechanism that generally controls the spatial allocation of visual attention: e.g., the guidance of eye movements and of spatially selective visual search (pattern recognition), and the attentionally-directed selective admission of items to memory. The great power and versatility of attentional control is achieved by embedding the salience map in a carefully architected interplay of bottom-up and top-down processes.