where the effects of potential drugs are tested indirectly in test tubes and in animals, followed by the clinical phase where therapeutics are tested directly in human volunteers. Medicine that passes both nonhuman and human testing is approved for sale to consumers.

Researchers have begun to construct models that optimize each part of the drug discovery process. For example, molecular deep learning has been applied to problems such as predicting the potential toxicity of putative medications and to chemical problems involved in the synthesis and design of drug-like molecules. Other researchers and companies are using deep convolutional networks to design new experiments that closely track cellular behavior on massive scales to obtain stronger understanding of novel biology. These applications have had some impact on the pharmaceutical world, but nothing dramatic yet since it isn't possible to build one drug discovery model that "designs" a novel drug. However, as more data gathering efforts continue and more biological and chemical deep learning models are designed, this state of affairs could change drastically in the next few years.

Deep Learning in Law

The legal industry relies heavily on precedent in the legal literature to make arguments about the legality or illegality of new cases. Traditionally, legions of paralegal researchers have been employed by large law firms to perform the needed lookups into the legal literature. In more recent years, legal search engines have become standard fare for most sophisticated firms.

Such search algorithms are still relatively immature, and it's likely that deep learning systems for neurolinguistic processing (NLP) can offer significant improvements. For example, a number of startups are working on building deep NLP systems that offer better querying of legal precedent. Other startups are working on predictive methods that use machine learning to predict the outcome of litigation, while a few are even experimenting with methods for automated generation of legal arguments.

In general, these sophisticated applications of deep models will take time to mature, but the groundswell of legal AI innovation likely heralds a dramatic shift in the legal profession.

Deep Learning for Robotics

The robotics industry has traditionally avoided deploying machine learning since it's not easy to prove that machine-learned systems are safe to deploy. This lack of safety guarantees can become a major liability when building systems that need to be safe for deployment around human operators.

In recent years, though, it's become clear that deep reinforcement learning systems, combined with low data learning techniques, can offer dramatic improvements in