Justifying Idealization by Abstraction

In my talk, I will suggest inferentially relevant explications for 'abstraction of a description' and 'idealization of a description'. There are many elucidations of 'idealization' and 'abstraction', but few of them are explications in the classical sense, that is, are meant to regulate the use of the explicated term without restricting the use of other terms. Even fewer of the elucidations have been developed to be inferentially relevant, that is, to be of use for distinguishing between valid and invalid inferences and thus to relate directly to questions of justification.

The restriction to descriptions (that is, sets of sentences) allows me to stay neutral on the status of abstractions and idealizations: As befits explications, the suggested explications do not presuppose or support realism or antirealism. The explications are given in terms of inferences relative to an arbitrary set of background assumptions, thereby allowing abstractions and idealizations relative to, for example, meaning postulates, metaphysical or physical postulates, or moral norms.

Distortions and omissions. A review of their uses of suggests that idealizations are special distortions and abstraction are special omissions. A description D *distorts* a description T iff D is incompatible with T (relative to the background assumptions). A description O *omits* from T iff O can be inferred from T, while T cannot be inferred from O. O omits all those consequences of T that cannot be inferred from O.

Omissions lead to robustness because any consequence of T that is omitted by O can make T false, but not O. On the other hand, everything that makes O false also makes T false. If O omits both from T and a distortion D of T, and O still correctly describes what is relevant (for example the phenomenon to be explained by T), then O justifies D relative to T and the phenomenon.

As an example, I consider the distortion of a potential well holding a particle. The distortion can be justified when only a qualitative description of the particle's wave function is sought, because then the exact shape of the well can be omitted. An example of an omission as a source of robustness comes from Beauchamp and Childress's four principles of biomedical ethics: The four principles are (allegedly) robust under a change from utilitarianism to deontological ethics.

Idealizations and abstractions. A review of different uses of 'abstraction' suggests that an *abstraction* A of a description T omits all and only those sentences that cannot be inferred from those consequences of T that are phrased in a sub-vocabulary $\mathscr{S}$. To let abstractions justify idealizations in the way that omissions justify distortions, call an *idealization* of T in $\complement\mathscr{S}$ a description I that distorts only consequences of T in the sub-vocabulary $\complement\mathscr{S}$. $\complement\mathscr{S}$ consists of those terms that are not in $\mathscr{S}$. Then I and T are incompatible, but their abstractions in $\mathscr{S}$ are equivalent. The four principles of biomedical ethics and the particle in a potential well also illustrate idealizations and abstractions.

My suggested explications capture some of the intuitions behind related, but ontologically less neutral suggestions by Cartwright and Nowak. The analysis shows that robustness stems from abstraction or omission, and not, as often claimed, from idealization or distortion.