

# Part III

## Exotic Smoothness and Space-Time Models

“... This result [the existence of an exotic  $\mathbb{R}^4$ ] could have great significance in all fields of physics, not just relativity, Some model of spacetime underlies every field of physics. It has now been proven that we cannot infer that space is necessarily smoothly standard from investigating what happens at spatial infinity, even for topologically trivial  $\mathbb{R}^4$ . It seems very clear that this is potentially very important to all of physics since it implies that there is another possible obstruction, in addition to material sources and topological ones, to continuing external vacuum solutions for any field equations from infinity to the origin. Of course, in the absence of any explicit coordinate patch presentation, no example can be displayed. However, this leads naturally to a conjecture, informally stated as:

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### Localized exotic smoothness

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## **LETTER**

### **Cosmological Anomalies and Exotic Smoothness Structures**

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**Conjecture 1.** This localized exoticness can act as a source for some externally regular field, just as matter or a wormhole can.”

“... In summary, what we want to emphasize is that without changing the Einstein equations or introducing exotic, yet undiscovered forms of matter, or even without changing topology, there is a vast resource of possible explanations for recently observed surprising astrophysical data at the cosmological scale provided by differential topology. ...”