The usual notion of differentiability in infinite-dimensional Banach spaces is Fréchet-differentiability. It can be viewed as a straight forward generalization of the finite-dimensional notion. The important feature of Fréchet differentiability is the validity of the chain-rule. However, there are different generalizations, and a new one is sc-differentiability. This notion also has a chain-rule. Sc-smoothness requires an additional structures on the Banach spaces, so-called sc-structures.

The striking difference between "Fréchet-smooth" and "sc-smooth" can be seen when studying maps $r : U \to U$, satisfying $r \circ r = r$, i.e. retractions, where U is an open subset of a Banach space. If r is Fréchet-smooth, then $r(U)$ is necessarily a submanifold of U. However, there are sc-smooth examples where $r(U)$ is finite-dimensional, but has locally varying dimension. There are also examples where a connected $r(U)$ has finite-dimensional as well as infinite-dimensional parts. If we consider pairs (O, E), where O is a subset of the sc-Banach space E and the image of an sc-smooth retraction, we obtain new local models for smooth spaces. We even can define the tangent of $T(O, E)$ by (TO, TE), where $TO = Tr(TU)$. Noting that by the chain-rule $Tr \circ Tr = Tr$ we see that TO is again an sc-smooth retract. As it turns out the definition does not depend on r as long as O is the image of r. We also can define what sc-smooth maps between local sc-models are. Evidently many constructions known from differential geometry can be carried over to a new "sc-retraction based differential geometry". Manifolds become M-polyfolds and orbifolds become polyfolds.

A nonlinear elliptic differential operator can usually be interpreted as a Fredholm section of a Banach space bundle and, given enough compactness, can be studied topologically. Many interesting problems in geometry are related to elliptic problems which show a lack of compactness, like bubbling-off. However these problems usually have fancy compactifications. Two such problems of interest are Gromov-Witten theory and the more general symplectic field theory. Due to serious compactness and transversality issues it is difficult to study them in a classical Banach manifold set-up. However, it turns out that they are much more easily described in the sc-retraction based differential geometry.

Finally, there is a generalization of the classical nonlinear Fredholm theory to the sc-world, which also has a build in Sard-Smale-type perturbation and transversality theory. In its applications to symplectic field theory the solution spaces are the compactified moduli spaces.