Krylov methods for shifted linear systems

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In my research, we focus on Krylov methods for so-called *shifted linear systems* of the form

$$(A - \omega_k I)\mathbf{x}_k = \mathbf{b}, \tag{1}$$

where $\{\omega_k\}_{k=1}^K \in \mathbb{C}$ is a sequence of distinct *shifts*. During the last 20 years, almost every Krylov method has been adapted to solve (1) efficiently for many shifts. In my presentation, I will show you how multi-shift Krylov methods work and, afterwards, point to some more recent research questions like:

- Can we allow multiple right-hand sides?
- Which preconditioners preserve the shifted structure?
- Can we apply restarting and nested algorithms?
- Can we benefit from deflation?
- Where do shifted systems arise in practice?