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**Alex Kasman\*** ([kasmana@cofc.edu](mailto:kasmana@cofc.edu)), Department of Mathematics, College of Charleston, Charleston, SC 29424. *Rank One Operators, Rank Six Quadrics and the Hirota Bilinear Difference Equation.*

The soliton theory of Sato tells us that the 3-term difference equation known as the HBDE is satisfied by a function  $\tau(t_1, t_2, t_3, \dots)$  if and only if  $\tau$  is constructable in a certain way from the action of the linear shift map on the infinite dimensional Grassmannian,  $Gr$ . This talk will address two questions whose answers demonstrate the underlying role of linear algebra, and different meanings of the term "rank".

1. What property of the shift map is responsible for its ability to produce  $\tau$ -functions?
2. How does this one difference equation imply all of the Plücker relations of  $Gr$ ?

The answer to the first (joint work with Michael Gekhtman, J. Geom. Phys 2006) is that one block in a decomposition of the operator must have rank one. The answer to the second question (joint work with Kathryn Pedings, Amy Reiszl and Taka Shiota, to appear) leads to a new way to describe Grassmannians as the intersection of rank six quadrics (an alternative characterization that involves only *one* Plücker relation – the simplest one – and a collection of linear maps under which it is pulled-back). (Received January 08, 2006)