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Bailey transform, WP-Bailey pairs and q-series transformations

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Abstract: In this paper, making use of WP-Bailey pairs and certain identities, we have established transformation formulae for basic (q-) hypergeometric series.
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1. Introduction, Notations and Definitions

Transformation theory play very important role in the theory of q-hypergeometric series. Rogers-Ramanujan type identities are established through transformation formulae and identities have great importance in the theory of partitions. In this paper, we have established certain transformation formulae for q-series by using WP-Bailey pairs. we employ usual notations

$$(a;q)_n = (1-a)(1-aq)...(1-aq^{n-1}), \quad n \geq 1,$$

$$(a;q)_0 = 1$$

$$(a;q)_\infty = \prod_{r=0}^{\infty}(1-aq^r)$$

and

$$(a_1, a_2, ..., a_r; q)_n = (a_1;q)_n(a_2;q)_n...(a_r;q)_n,$$

$$(a_1, a_2, ..., a_r; q)_\infty = (a_1;q)_\infty(a_2;q)_\infty...(a_r;q)_\infty.$$

An ${}_r\Phi_s$ basic hypergeometric series is defined by

$${}_r\Phi_s\left[\begin{matrix} a_1, a_2, ..., a_r; q; z \\ b_1, b_2, ..., b_s \end{matrix}\right] = \sum_{n=0}^{\infty} \frac{[a_1, a_2, ..., a_r; q]_n z^n}{[q, b_1, b_2, ..., b_s; q]_n}\left[(-)^n q^{n(n-1)/2}\right]^{1+s-r} \quad (1.1)$$

W.N. Bailey in 1944 stated a theorem which is simple but very useful.
If

$$\beta_n = \sum_{r=0}^{n} \alpha_r u_{n-r} v_{n+r} \quad (1.2)$$