# EC2 SUPPLEMENT: PAPERBACK EDITION OF 2001

Richard P. Stanley

version of 1 June 2022

Here I will maintain supplementary material for *Enumerative Combinatorics*, volume 2 (paperback edition of 2001). This will include errata, updated references, and new material. I will be continually updating this supplement.

NOTE. References to math.CO refer to the combinatorics section of the xxx Mathematics Archive at xxx.lanl.gov/archive/math. A front end site for math.CO is front.math.ucdavis.edu/math.CO.

- p. 6, line 10. Change situtations to situations.
- p. 11, line 3. Change $E_c(n)$ to $E_c(x)$.
- p. 18, line 3. Change $(n)_2$ to $n(n-2)$.
- p. 20, line 9. Change $Z(\mathfrak{S}_n)$ to $\tilde{Z}(\mathfrak{S}_n)$.
- p. 24, line 4 (after figure). Change $\lim_{n\to\infty}$ to $\lim_{k\to\infty}$.
- p. 25, line 5. Change $\subseteq$ to $\in$.
- p. 33, line 5–. Change $\mathrm{ord}(\tau_k)$ to $\mathrm{ord}(\tau_j)$.
- p. 34, Lemma 5.3.9. Delete the first sentence, viz., "Let $w \in \mathcal{A}^*$."
- p. 35, line 10. Change $w \in \mathcal{B}^*$ to $w \in \mathcal{B}^*_{\mathbf{r}}$.
- p. 35, line 8–. Change $\mathbb{A}$ to $\mathcal{A}$.
- p. 36, lines 15–16. Change "beginning with a 1" to "ending with a $-1$".
- p. 36, line 1–. Insert $+\cdots$ before $=$. (The left-hand side is an infinite sum.)

- p. 42, line 11. Change $t^{r_1}$ to $t_1^{r_1}$.

- p. 51, line 9–. Change $Q_i = \Pi_i^{(2)}$ to "when $Q_i$ is given by Example 5.5.2(d) for $r = 2$".

- p. 59, line 9. Change "Since the rows" to "Since the columns".

- p. 59, line 13. Change "Because the columns" to "Because the rows".

- p. 62. Example 5.6.12, line 5. Change "modulo $n$" to "modulo $2^n$".

- p. 63, line 12. Change "sequence" to "sequences".

- p. 65, line 8. Change "Theorem" to "Lemma".

- page 80, Exercise 5.21, line 1. The equation reference to the second edition of EC1 should be (4.41).

- p. 87, equation (5.111). We need to add the further condition that $p_n(0) = \delta_{0n}$. Otherwise, for instance, the polynomials $p_n(x) = (1+x)^n$ satisfy (iv) with $Q = \frac{d}{dx}$ but fail to satisfy (i)–(iii).

- p. 97, Exercise 5.51. It is not true that (ii) implies (i), e.g., when $C(x) = c$. One needs to add the hypothesis that $[x]C(x) \neq 0$, so that $(C(x) - c)^{\langle -1 \rangle}$ exists. Substituting $xC(B(x))$ for $x$ in (ii) yields

  $$xC(B(x))/C(A(xC(B(x)))) = x,$$

  so $C(B(x)) = C(A(xC(B(x))))$. Substituting $B(x)^{\langle -1 \rangle}$ for $x$ yields $C(x) = C(A(B(x)^{\langle -1 \rangle}C(x)))$. Subtract $c$ from both sides and apply $(C - c)^{\langle -1 \rangle}$ to get $x = A(B(x)^{\langle -1 \rangle}C(x))$. Applying $A^{\langle -1 \rangle}$ to both sides gives (i). This argument is due to Daniel Giaimo and Amit Khetan and (independently) to Yumi Odama.

- p. 101, line 3. Change $J_0[(2-t)/\sqrt{t-1}]$ to $J_0\left(\sqrt{-t}\,(2-t)/(1-t)\right)$.

- p. 102, Exercise 5.71. It would be better not to specify the degree $d$ of $G$, since (as stated in the solution) $d = \lambda_1$.

- p. 103, Exercise 5.74(d). Replace the first two sentences with: Show that all vertices have the same outdegree $d$. (By (c), all vertices then also have indegree $d$.)

- p. 103, Exercise 5.74(f). For further information, see F. Curtis, J. Drew, C.-K. Li and D. Pragel, *J. Combinatorial Theory (A)* **105** (2004), 35–50, and the references given there.

- p. 108, Exercise 5.7(a), line 7. Change $b_{2n}$ to $b_{2n-k}$.

- p. 137, Exercise 5.45, line 1. Change $kxy^k$ to $(k+1)xy^k$.

- p. 137, Exercise 5.45, line 4. Change this equation to

$$y = x + 2xy + 3xy^2 + \cdots = \frac{x}{(1-y)^2}.$$

- p. 139, Exercise 5.47(c), line 7. A direct combinatorial proof was given by M. Bousquet-Mélou and G. Schaeffer, *Advances in Applied Math.* **24** (2000), 337–368.

- p. 147, Third Solution. The first two lines should be: Equation (5.53) can be rewritten (after substituting $n+k$ for $n$)

$$(n+k)[x^n]\frac{1}{k}\left(\frac{F^{\langle -1\rangle}(x)}{x}\right)^k = [x^n]\left(\frac{x}{F(x)}\right)^{n+k}. \qquad (5.140)$$

- p. 162, lines 13– to 12–. Change "Thus any algebraic power series, as defined in Definition 6.1.1" to "Thus any algebraic function, i.e, any solution $\eta$ to (6.2)".

- p. 175, line 1. Change $\{9, 11\}$ to $\{9, 14\}$.

- p. 175, line 2. Change $x^{11}$ to $x^{14}$.

- p. 175, line 4. Change $v^{11}$ to $v^{14}$.

- p. 175, line 11. Change Theorem 5.4.1 to Theorem 5.4.2.

- p. 176, line 4–. Change $(n+2)$-gon to $(n+1)$-gon.

- p. 178, line 16. Change intesect to intersect.

- p. 190, Theorem 6.4.6. It should be assumed that char $K = 0$, since this assumption is used for (6.12). On the other hand, *every* power series over a field of characteristic $p > 0$ is $D$-finite since its $p$th derivative is 0. See MathOverflow 420530.

- p. 192, line 9–. Change $u(0) = 0$ to $v(0) = 0$.

- p. 192, lines 8– to 7–. The example $v = \log(1 + x^2) - 1$ is confusing since $v(0) \neq 0$. Nevertheless the series $u(v(x)) = \sqrt{\log(1 + x^2)}$ is well-defined formally since we can write

$$\sqrt{\log(1 + x^2)} = x\sqrt{\frac{\log(1 + x^2)}{x^2}}.$$

It would have been more accurate to define

$$v(x) = \frac{\log(1 + x^2)}{x^2} - 1.$$

The same remarks apply to Exercise 6.59.

- p. 212, line 1. The statement that Catalan number enumeration originated with Segner and Euler in 1760 (or actually 1758/59 in the cited references) is inaccurate. The enumeration of polygon dissections was stated by Euler in a letter to Goldbach in 1751. This letter is printed in P.-H. Fuss, *Correspondance Mathématique et Physique*, Tome. 1, Acad. Sci. St. Petersburg, 1843; reprinted in The Sources of Science, No. 35, Johnson Reprint Corporation, New York and London, 1968, pp. 549–552.

- p. 212, lines 16–17. I have forgotten the source for the statement that Netto was the first to use the term "Catalan number." Can anyone provide a reference?

- p. 219, Exercise 6.16. A combinatorial proof was first given by R. Sulanke, *Electronic J. Combinatorics* **7**(1), R40, 2000. A sharper result was subsequently proved combinatorially by D. Callan, A uniformly distributed parameter on a class of lattice paths, math.CO/0310461.

- p. 221, Exercise 6.19(j).This problem appeared as Problem A5 on the 2003 William Lowell Putnam Mathematical Competition. Many participants found the following bijection with 6.19(i) (Dyck paths from $(0, 0)$ to $(2n, 0)$): Let $D$ be a Dyck path from $(0, 0)$ to $(2n, 0)$. If $D$ has no maximal sequence of $(1, -1)$ steps of even length ending on the $x$-axis, then just prepend the steps $(1, 1)$ and $(1, -1)$ to the beginning of $D$. Otherwise let $R$ be the rightmost maximal sequence of $(1, -1)$

steps of even length ending on the $x$-axis. Insert an extra $(1,1)$ step at the beginning of $D$ and a $(1,-1)$ step after $R$. This gives the desired bijection.

- p. 224, item **ii**, line 5. Change $S(w) = w$ to $S(w) = 12\cdots n$.

- p. 228, item **iii**, line 3. To be precise, the displayed sequences should have the intial and final 1's deleted.

- p. 230, Exercise 6.21(b), line 3. Change 5.3.11 to 5.3.12

- p. 230, Exercise 6.23. Brian Rothbach has pointed out that this problem can be given another stipulation: serieshelpmate in 20. By parity considerations (Black cannot lose an odd number of moves with a knight) the solution is the same as before except Black plays Pa7-a6 instead of Pa7-a5. Thus the number of solutions is $C_{10} = 16796$.

- p. 233, Exercise 6.30, line 3. It would be less ambiguous to change "this exercise" to "that exercise".

- p. 235, Exercise 6.34, line 4. At the end of the line it should be mentioned that the polynomial $g(L_n, q)$ of Exercise 3.71(f) is a further $q$-analogue of $C_n$. An additional reference for this polynomial is R. Stanley, *J. Amer. Math. Soc.* **5** (1992), 805–851 (Prop. 8.6).

- p. 236, Exercise 6.34(b,c). While (b) is correct as stated (in the paperback edition of 2001), it would be best to change $q^n c_n(q)$ on line 6 to $c_n(q)$ (as it was in the hardcover edition of 1999) and "nonnegative" on line 8 to "nonpositive". In this way part (c) remains valid. If part (b) is kept as it is, then change $c_n(t;q)$ in line 4 of part (c) to $q^n c_n(t;q)$.

- p. 238, Exercise 6.38(d), line 1. Change $(n,n)$ to $(n,0)$.

- p. 239, Exercise 6.39(h). A period is missing at the end of the sentence.

- p. 241, Exercise 6.41, line 1. Change $S^2(w) = w$ to $S^2(w) = 12\cdots n$.

- p. 247, Exercise 6.59. See the item above for p. 192, lines 8– to 7–.

- p. 250, Exercise 6.3, line 3. Replace "$r = s + \frac{1}{2}$ for some $s \in \mathbb{Z}$" with "$r$ cannot be a negative integer".

- p. 250, Exercise 6.3, paragraph 3. The earliest proof that $\sum_{n\geq 0}\binom{2n}{n}^t x^n$ isn't algebraic for any $t\in\mathbb{N}$, $t>1$, appears in the paper P. Flajolet, *Theoretical Computer Science* **49** (1987), 283–309 (page 294). Flajolet shows that if $\sum a_n x^n$ is algebraic and each $a_n\in\mathbb{Q}$, then $a_n$ satisfies an asymptotic formula

$$a_n = \frac{\beta^n\, n^s}{\Gamma(s+1)}\sum_{i=0}^{m} C_i\omega_i^n + O(\beta^n n^t),$$

where $s\in\mathbb{Q}-\{-1,-2,-3,\dots\}$, $t<s$, $\beta$ is a positive algebraic number, and the $C_i$ and $\omega_i$ are algebraic with $|\omega_i|=1$. A simple application of Stirling's formula shows that if $a_n=\binom{2n}{n}^t$, then $a_n$ does not have this asymptotic form when $t\in\mathbb{N}$, $t>1$.

- p. 256, Exercise 6.19(d), line 2. Delete "ignoring the root edge".

- p. 257, Exercise 6.19(k). Update the reference to *J. Integer Seq.* **4** (2001), Article 01.1.3; available electronically at

  `http://www.research.att.com/∼njas/sequences/JIS`.

- p. 258, Exercise 6.19(s), line 1. Change $a_i$ to $a_i-1$.

- p. 260, Exercise 6.19(ee), lines 10–12. The statement that the first published proof of the enumeration of 321-avoiding permutations is due to D. G. Rogers is inaccurate. Knuth provided such a proof in 1973 in the reference given in the first paragraph of the solution. Moreover, a bijective proof was found by D. Rotem, *Inf. Proc. Letters* **4** (1975), 58–61.

- p. 274, line 2. Change "D. Vanquelin" to "B. Vauquelin".

- p. 275, Exercise 6.40, line 6. Change M. O. J. to W. O. J.

- p. 278, Exercise 6.53, line 3. Change $Q(x)=x-2$ to $Q(x)=-x-2$.

- p. 281, Exercise 6.60. An elegant proof based on Gröbner bases was given by Chris Hillar, *Proc. Amer. Math. Soc.* **132** (2004), 2693–2701.

- p. 282, Exercise 6.63(b), line 2. Change 1847 to 1848.

- p. 293, lines 11-13. Replace ", and such that the ... exist.)" with a period. (The deleted condition automatically holds.)
- p. 295, Figure 7-3. In the expansion of $h_{41}$, the coefficient of $m_{41}$ should be 2.
- p. 298, line 10–. Change "if follows" to "it follows".
- p. 301, line 7. Change 1.1.9(b) to 1.9(b).
- pp. 314–315, proof of Proposition 7.10.4. Change $\lambda$ to $\lambda/\mu$ throughout proof.
- p. 317, line 12–. Change "clearly impossible" to "clear".
- p. 329, line 15–. Change $x$'s to $X$'s.
- p. 336, line 7 (counting the displayed tableau as a single line). Change 7.8.2(b) to 7.8.2(a).
- p. 346, line 3–. Change "forms a border strip" to "forms a border strip or is empty".
- p. 346, line 1–. Change $\lambda^i/\lambda^{i+1}$ to $\lambda^{i+1}/\lambda^i$.
- p. 348, line 9. Change $\chi_\lambda(\mu)$ to $\chi^\lambda(\mu)$.
- p. 352, line 2 of proof of Proposition 7.18.1. Change $\sum_\mu z_\lambda^{-1} f(\lambda) p_\mu$ to $\sum_\lambda z_\lambda^{-1} f(\lambda) p_\lambda$.
- p. 354, line 4. Change "in" to "is".
- p. 354, line 5. Change "a integral" to "an integral".
- p. 355, line 4. Add a period after "nonnegative".
- p. 359, line 6. Change the subscript $\alpha_S$ to $\mathrm{co}(S)$.
- p. 364, line 1. Change $e(D(T))$ to $e(\mathrm{co}(D(T)))$.
- p. 370, line 3 of second proof. Change 1.22(d) to 1.23(d).

- p. 377, line 7; p. 378, line 8; page 378, line 10–. Change $\pi \in B(r, c, t)$ to $\pi \subseteq B(r, c, t)$.

- p. 379, line 5–. Insert $\pi$ after the first "partition", and change $\lambda^*$ to $\pi^*$.

- p. 379, line 4–. Change "similary" to "similarly".

- p. 381, line 4–. Change 4.5.6 to 4.5.8.

- p. 383, line 9. Change "$D(w) = T'$ and $D(w^{-1}) = T$" to "$D(w) = D(T')$ and $D(w^{-1}) = D(T)$".

- p. 395, line 10–. Change "Burnside's theorem" to "Burnside's lemma".

- p. 404, line 3–. Littlewood first introduced plethysm in his paper "Polynomial concomitants and invariant matrices," *J. London Math. Soc.* **11** (1936), 49–55 (page 52).

- p. 416, line 7–. Change $u_{i_{t+2}}$ to $u_{j_{t+2}}$.

- p. 418, line 7. Change "subsequences" to "subsequence".

- p. 419, line 16. Change "was" to "is".

- p. 421, line 9–. Insert "a" after "such".

- p. 421, lines 8– to 7–. Change "second statement of Theorem A1.1.4" to "first assertion of Theorem A1.1.6".

- p. 422, line 3. Change A1.1.4 to A1.1.6.

- p. 424, line 11. Delete "by".

- p. 426, line 6–. Change "tableaux in (A1.137)" to "tableau defined by (A1.137)".

- p. 439, line 7. Delete comma after 156.

- p. 442, Theorem A2.4, line 9. Change "Hence" to "Moreover,".

- p. 443, line 11. Change

$$\operatorname{char}\varphi = (x_1 \cdots x_n)^{-1} = (x_1 \cdots x_n)^{-1} s_\emptyset$$

to

$$\operatorname{char}\varphi = x_1^{-1} + \cdots + x_n^{-1} = (x_1 \cdots x_n)^{-1} s_{1^{n-1}}$$

- p. 444, line 12. Delete "char".

- p. 444, line 11–. Change "given by (A2.156)" to "generated (as a $\mathbb{C}$-algebra) by (A2.156)".

- p. 447, line 3–. Change $s_1(x_1^{\lambda_i})$ to $s_1(x_1^{\lambda_i}, x_2^{\lambda_i}, \ldots)$.

- p. 451, Exercise 7.13(a). This exercise is stated incorrectly. For instance, $K_{777,6654} = 1$, contrary to the statement of the exercise. One way to state the correct result is as follows. Let the parts of $\lambda'$ be given by

$$\begin{aligned}\lambda'_1 = \cdots = \lambda'_{n_1} > \lambda'_{n_1+1} = \cdots = \lambda'_{n_2} > \lambda'_{n_2+1} = \cdots \\ > \lambda'_{n_{k-1}+1} = \cdots = \lambda'_{n_k} > 0.\end{aligned}$$

Define $\lambda^{(j)} = (\lambda'_{n_{j-1}+1}, \ldots, \lambda'_{n_j})$ (with $n_0 = 0$), so $\lambda^{(j)}$ is a partition of rectangular shape. Let $\mu$ be a partition with $|\mu| = |\lambda|$, and let

$$\mu^{(j)} = (\mu_{n_{j-1}+1}, \ldots, \mu_{n_j}).$$

Then $K_{\lambda\mu} = 1$ if and only if $\lambda \geq \mu$ (dominance order) and

(i) $|\lambda^{(j)}| = |\mu^{(j)}|$ and $\lambda^{(j)} \geq \mu^{(j)}$ for all $j$.

(ii) For all $1 \leq j \leq k$ either $0 \leq \mu'_{n_{j-1}+1} - \lambda'_{n_{j-1}+1} \leq 1$ or $0 \leq \lambda'_{n_j} - \mu'_{n_j} \leq 1$.

- p. 452, line 6. Change "$k$ times" to "$n$ times".

- p. 452, Exercise 7.16(a), line 5. Change $c_{i-j} + c_{i+j}$ to $c_{i-j} - c_{i+j}$.

- pp. 452–453, Exercise 7.16(b,e). The formulas for $y_i(n)$ and $u_i(n)$ have been extended to $i \leq 6$ by F. Gascon, *Fonctions de Bessel et combinatoire*, Publ. LACIM **28**, Univ. du Québec à Montréal, 2002 (page 75). In particular,

$$y_6(2n) = 6(2n)! \sum_{k=0}^{n} \frac{(10n - 13k + 8)C_{k+1}}{(n-k+2)!\,(n-k)!\,(k+4)!\,k!},$$

where $C_{k+1}$ denotes a Catalan number.

- p. 459, Exercise 7.30(c), line 4. Change $d-1$ to $d$.

- p. 460, Exercise 7.37. For further information on expanding $a_\delta^2$ in terms of Schur functions, see

  `http://www.phys.uni.torun.pl/~bgw/vanex.html`.

- p. 461, Exercise 7.42, line 2. Change $s_{\tilde\lambda}(y)$ to $s_{\widetilde{\lambda'}}(y)$.

- p. 466, line 3–. Change $(\lambda_i-1)!(\lambda_i'-1)!$ to $(\lambda_i-i)!(\lambda_i'-i)!$.

- p. 467, Exercise 7.55(b). Let $f(n)$ be the number of $\lambda\vdash n$ satisfying (7.177). Then

$$\begin{aligned}(f(1),f(2),\dots,f(30)) = (&1,1,1,2,2,7,7,10,10,34,40,53,61,\\ &103,112,143,145,369,458,579,712,938,1127,\\ &1383,1638,2308,2754,3334,3925,5092).\end{aligned}$$

  The problem of finding a formula for $f(n)$ was solved by Arvind Ayyer, Amritanshu Prasad, and Steven Spallone, `arXiv:1604.08837`.

- p. 467, Exercise 7.59. In order for the bijection $\lambda\mapsto(\lambda^0,\lambda^1,\dots,\lambda^{p-1})$ given in the solution to part (e) (page 517) to be correct, it is necessary to define a specific indexing of the terms of $C_\lambda$. Namely, index a term $a$ by $c_i$ if $i=i_1-i_0$, where $i_1$ is the number of 1's weakly to the left of $a$, and $i_0$ is the number of 0's strictly to the right of $a$ (so if $a=1$, then this contributes to $i_1$). The sequence becomes $\cdots c_{-2}c_{-1}c_0c_1c_2\cdots$ as before, so it suffices to define the indexing by letting the first 1 be $c_{i_0-1}$, where $i_0$ is the number of 0's following this 1.

  *Example.* If $\lambda=(4,3,3,3,1)$, then $C_\lambda=\cdots 0010110001011\cdots$. The first 1 in this sequence is $c_{1-4}=c_{-3}$. On the other hand, if $\lambda=(3,3,3,2,2,1)$, then $C_\lambda=\cdots 0010100100011\cdots$. Now the first 1 is $c_{1-6}=c_{-5}$.

- p. 468, Exercise 7.59(e), line 3. Change $Y^k$ to $Y^p$.

- p. 469, Exercise 7.61, line 2. Change "0 or 1" to "0 or $\pm 1$".

- p. 474, Exercise 7.70, line 3. Under the second summation sign insert a space between "in" and $\mathfrak{S}_n$.

- p. 485, line 3–. The asymptotic formula for $a(n)$ should be multiplied by a factor of $1/\sqrt{3\pi}$. The factor $1/\sqrt{\pi}$ was included by Wright and omitted here by mistake. The additional factor $1/\sqrt{3}$ was omitted by Wright, though his proof makes it clear that it should appear. See L. Mutafchiev and E. Kamenov, `math.CO/0601253`.

- p. 491, Exercise 7.9, line 1. Insert $\varepsilon_\lambda$ before $a_{\lambda\mu}e_\lambda$.

- p. 492, Exercise 7.11. Change $\binom{j}{\ell(\mu)-1}$ to $\binom{\ell(\mu)-1}{j}$ (three times).

- p. 493, Exercise 7.13(a). For another proof, see A. N. Kirillov, *Europ. J. Combinatorics* **21** (2000), 1047–1055, arXiv:hep-th/9304099 (Prop. 2.2).

- p. 494, line 4. Change 169–172 to 175–177.

- p. 494, Figure 7-20. Change the labels $\mathrm{R_1h6}$, $\mathrm{R_1h5}$, and $\mathrm{R_2h6}$ to $\mathrm{R_1a6}$, $\mathrm{R_1a5}$, and $\mathrm{R_2a5}$, respectively.

- p. 496, equation (7.199). Change $(m_i(\lambda)!)^{-1}$ to $[\prod_i (m_i(\lambda)!)^{-1}]$.

- p. 498, Exercise 7.22(h), line 7. Update the Fomin and Greene reference to *Discrete Math.* **193** (1998), 179–200.

- p. 500, displayed tableaux near end of Exercise 7.24. The tableaux $T_8$ and $T_9$ are missing the element 8 to the right of 3. Also, the $\{3, 10\}$ under $T_9$ should be under $T_{10}$.

- p. 502, Exercise 7.27, first displayed equation. Change $(n)_m$ to $(n)_{n-m}$.

- p. 505, Exercise 7.32(a). Stembridge's more general result appears in "Computational aspects of root systems, Coxeter groups, and Weyl characters," in *Interactions of Combinatorics and Representation Theory*, MSJ Memoirs **11**, Math. Soc. Japan, Tokyo, 2001, pp. 1–38 (Theorem 7.4).

- p. 506, Exercise 7.37(b), line 2. Change $s_{\tilde{\lambda}'}(x)$ to $s'_{\tilde{\lambda}}(x)$. (The tilde is moved slightly to the left, possibly the most obscure correction appearing in this Supplement.)

- p. 508, Exercise 5.41, line 3 of "*Combinatorial proof.*" Change $\tilde{T}$ to $T'$.
- p. 514, Exercise 7.47(m), lines 1–3. Update the reference to R. Stanley, *Discrete Math.* **193** (1998), 267–286.
- p. 514, Exercise 7.47(m). The conjecture of Hamidoune was proved (without using symmetric functions) by M. Chudnovsky and P. D. Seymour, *J. Comb. Theory, Ser. B* **97** (2007), 350–357.
- p. 514, Exercise 7.48(b), lines 2–4. Update the reference to R. Simion and R. Stanley, *Discrete Math.* **204** (1999), 369–396.
- p. 514, line 1–, and p. 515, line 1. "*Ibid.*" refers to the reference in the item above, not to the previous reference in the book.
- p. 515, line 3. "the reference" refers to the reference two items above, viz., R. Stanley, *Electron. J. Combinatorics* **3**, R6 (1996), 22 pp.
- p. 515, Exercise 7.49. Update this reference to C. Lenart, *J. Algebraic Combin.* **11** (2000), 69–78.
- p. 516, line 8. Change $(\lambda_i - 1)!(\lambda'_i - 1)!$ to $(\lambda_i - i)!(\lambda'_i - i)!$.
- p. 516, Exercise 7.54. The following elegant solution is due to Katerina Kalampogia-Evangelinou. Expand $s_\lambda$ in terms of power sums and set $x_i = q^{i-1}$ (principal specialization). If $\mu$ has no even part, then $p_\mu(1, q, q^2, \dots)$ has no pole at $q = -1$. If $\lambda$ has an even hook length, then by Corollary 7.21.3 $s_\lambda(1, q, q^2, \dots)$ has a pole at $q = -1$, and the proof follows.
- p. 517, Exercise 7.59(e), line 3. Change $Y^k$ to $Y^p$.
- p. 517, Exercise 7.59(e), line 10. Change $Y_\emptyset$ to $Y_{p,\emptyset}$, and change $Y^k$ to $Y^p$.
- p. 518, Exercise 7.59(h), line 1. Change $Y_\emptyset$ to $Y_{p,\emptyset}$, and change $Y^k$ to $Y^p$.
- p. 518, Exercise 7.59(h), line 2. Change $Y^k$ to $Y^p$ (three times).
- p. 518, Exercise 7.59(h), line 3. Change $Y^k$ to $Y^p$.

- p. 520, line 3–. Change $\sum_{n\geq 0} h_{2n+1}t^{2n+1}$ to $\sum_{n\geq 0}(-1)^n h_{2n+1}t^{2n+1}$
- p. 535, lines 7–10. Replace the sentence "No proof ... are known." with "A bijective proof of the unimodality of $s_\lambda(1, q, \ldots, q^n)$ was given by A. N. Kirillov, *C. R. Acad. Sci. Paris*, Sér. I **315** (1992), 497–501."
- p. 537, Exercise 7.78(f), line 6. Change $s_\mu(x)$ to $s_\mu(y)$ and $s_\nu(x)$ to $s_\nu(z)$.
- p. 544, part (e), lines 1–2. Change "the dual Jacobi-Trudi identity (Corollary 7.16.2)" to "iterating the dual Pieri identity (page 340)".
- p. 550, Exercise 7.100(c), line 3. Insert $\}$ after $\leq a$.
- p. 576, line 7. Change work to word.
- p. 580. Change "Valquelin, D." to "Vauquelin, B.".