

DREUX DE NETTANCOURT ■ **Incompatibility and Incongruity
in Wild and Cultivated Plants**

2nd Edition

DREUX DE NETTANCOURT

 **Incompatibility and Incongruity
in Wild and Cultivated Plants**

Second, totally revised and enlarged edition

With 41 Figures in 67 separate Illustrations and 19 Tables



Springer

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Cover illustration: Cross section of an incompatible pollen tube in the intercellular space of the stylar conducting tissue of *Lycopersicum peruvianum* (courtesy University of Siena). The endoplasmic reticulum shows a concentric parallel configuration (de Nettancourt et al. 1973 a)

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*To Gabrielle, my wife,
for her encouragement, patience
and everlasting guidance
regarding the word processor*

Preface

The aim of this book is to provide a picture, as complete as possible, of the current state of knowledge of pollen-pistil barriers in flowering plants and of the ability of man to silence, mutate or transfer the genes that control them. The work was conducted in two phases. The first one essentially consisted of a review of early work, such as it had been summarized in a monograph I wrote in 1977 regarding the main features, origin and classification of self-incompatibility systems, their distribution among the angiosperms, the modalities of their inheritance at the scale of individuals and populations, the mutability of SI genes, and their possible involvement in the control of barriers between species. The major part of this information was derived from the 1977 monograph and systematically enriched (when material was available) by an account of more recent or contemporary research on the distribution, genetics and population genetics of SI. The second phase, by far the most challenging, consisted of the description and review of the very impressive and abundant research results that have accumulated, since the early 1980s, on the cellular and molecular biology of pollen-pistil interactions. The nature of this research, although the ultimate objectives (understanding and control of pollen-pistil barriers) remained unchanged, was radically modified by the new ability of man to perform analyses of life at the molecular level and to exploit all the techniques of modern biology to study the structure, action, function, mutation, reconstruction and evolution of the genes and mechanisms that participate in the recognition and rejection of incompatible pollen grains and pollen tubes.

A major difficulty in the preparation of a book of this type, which covers the interactions of many different disciplines, deals with the classification and distribution of information. It is necessary to compromise between repetition and overlap, essential if each chapter is to be considered separately, and cross-referencing, required for the unity of the work. Furthermore, I have not been able to avoid the creation of an opening chapter

devoted to a general presentation of pollen-pistil barriers; it is not intended to summarize the book but to provide the perspective necessary for direct access to the matter covered by the other chapters. Again, I had to choose between cross-referencing and the duplication of information.

■ The Role of Professor Linskens

The person to blame is Professor H.F. Linskens. Not only did he suggest the first edition of this book approximately 25 years ago, he proposed this "*bis repetita placent*" episode of pollen-pistil tribulations. However, he meant well. I must say that Professor Linskens tried to make up for his impulses through his constant support and the regular transmission of a very impressive amount of information. I not only owe him the text of articles by Correns (1913), Sutton (1918), Brieger (1930) and Sears (1937) but also articles discussing the latest state of the art (to the end 1999) of pollen-part mutations, the dimer hypothesis, pollen-tube-directed differential ovule development and the biochemistry of haplotype dominance. Through him, from several of his six working addresses in Europe and America, I received extensive collections of abstracts from recent papers that dealt with all possible aspects of pollen-pistil interactions. None of my mistakes, misinterpretations or omissions can be attributed to him, but he must be credited for his support and the suggestions that enabled me to improve my work.

■ Help from the Scientific Community at Large and from Colleagues at Louvain-la-Neuve

Other people, in addition to Professor Linskens, gave advice and information. Dr. V.E. Franklin-Tong kindly provided explanations of the functional significance of the interaction between stigmatic S-proteins and SPB, a pollen protein, in the field poppy (Jordan et al. 1999, but unpublished at the time). She informed me, on this occasion, of the discovery, by a Birmingham group (N.N. Jordan and co-workers), of the first evidence that programmed cell death was involved in the rejection phase of SI. Professor B.A. McClure kindly commented on the research results at his laboratory and provided unpublished information and an illustration (Fig. 5.3) regarding work dealing with unilateral inter-species incompatibility. Professor Wehling

described the results of his attempts to test the Bm2 probe of *Phalaris coerulescens*, supplied by Professor Langridge, as a candidate for the S-gene in rye. Professor M. Cresti contributed the unpublished micrographs of incompatible pollen tubes, which are now Fig. 3.1 and Fig. 5.1.

I thank all of them wholeheartedly, and I also express my deep gratitude to the scientists and the publishers who so kindly contributed photographs, drawings or tables from early or recent work and authorized me to use them in my book. Their very kind cooperation is acknowledged in the captions of figures and tables.

Finally, I want to thank the University of Louvain and the Unit for Physiological Biochemistry (FYSA) for the hospitality and the help that was generously and kindly given to me. My gratitude goes, in particular, to Professor A. Goffeau, former director of FYSA, and to Professor M. Boutry, who replaced him after his retirement. I appreciate the instructive discussions I had with them on the expression, cloning, sequencing and reconstruction of genes from yeast and higher plants.

Mr. Philip Menier competently advised and participated in the treatment and harmonization of 1200 references from several bibliographies, which Mrs. C. Durand reconstituted in part and which, at a later stage, Mrs. M. Rochat processed, checked and finalized with admirable patience. They cannot be blamed, of course, for flaws in the raw material provided to them. Mrs. A.M. Faber skillfully prepared the assembly of microphotographs and the computer drawing of diagrams.

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Contents

■ 1	The Basic Features of Self-Incompatibility	1
1.1	A Definition	1
1.2	Nature of the SI Reaction	2
1.3	Classification of SI Systems	3
1.3.1	The Time of Gene Action in the Pistil	3
1.3.2	The Time of Gene Action in the Stamen	4
1.3.2.1	Determination of the Pollen Phenotype in Gametophytic Systems	4
1.3.2.2	Determination of the Pollen Phenotype in Sporophytic Systems	6
1.3.3	The Association with Floral Polymorphism . . .	7
1.3.3.1	The Distylic Condition	8
1.3.3.2	Tristyly	9
1.3.4	The Site of Gene Expression	10
1.3.4.1	Stigmatic Inhibition	10
1.3.4.2	Stylar Inhibition	11
1.3.4.3	Ovarian Inhibition	12
1.3.5	The Number of Genetic Loci and the Involvement of Polyallelic Series	13
1.3.5.1	The Genetic Basis of Recognition	13
1.3.5.1.1	Control by a Single but Complex Locus	13
1.3.5.1.2	Recognition by Two Unlinked Loci in the Grasses	14
1.3.5.1.3	Recognition by Two or More Loci in Several Other Families	14
1.3.5.2	Polyallelism at the Incompatibility Loci	14
1.3.5.3	How Many Genes are Involved in the Rejection Process?	15
1.3.5.3.1	Stigmatic SSI	15
1.3.5.3.2	Stigmatic GSI	15
1.3.5.3.3	Stylar GSI	15

1.4	Recapitulation on the Classification of SI Systems	16
1.5	The Distribution of SI Systems in the Angiosperms	17
1.5.1	Incidence of SI in the Families of Flowering Plants	17
1.5.2	Distribution of SI among Species Important for Agriculture	21
1.6	Chronology of Early Researches on SI	23
■ 2	The Genetics of Self-Incompatibility	25
2.1	Sporophytic Heteromorphic Systems	25
2.1.1	Distyly	25
2.1.1.1	A Supergene... ..	26
2.1.1.2	...Within Which Recombination Occurs	27
2.1.1.3	The Supergene is Controlled by Modifier Genes	28
2.1.2	Tristyly	28
2.1.2.1	Homomorphic Variants and Supergenes in Tristyly	30
2.1.2.2	One Genotype, Two Phenotypes	30
2.1.2.3	Dominance Change in <i>O. articular</i>	30
2.1.2.4	Breeding Behavior Can be Independent of Floral Heteromorphism	31
2.1.3	Multi-Allelic Series in Species with Incomplete Heterostyly?	31
2.2	Sporophytic Homomorphic Stigmatic Control	31
2.2.1	Two Di-Allelic Loci	31
2.2.2	A Single Locus with Polyallelic Series, Dominance and Competitive Interaction: the <i>Brassica</i> Type	32
2.2.2.1	The <i>Brassica</i> Haplotypes	34
2.2.2.1.1	Class-I Haplotypes	35
2.2.2.1.2	Class-II Haplotypes	35
2.2.2.2	Extension of the Haplotype Concept to Other Genes, Other Families and Other Systems	36
2.2.2.3	S-Locus-Related (SLR) Genes in <i>Brassica</i>	37
2.2.2.4	Many Genes in the S-Linkage Group	37
2.2.3	A Single Sporophytic Stigmatic Locus with Multiple Alleles but without Dominance and Competitive Interaction	38
2.2.4	Three or Four Polyallelic Loci in <i>Eruca sativa</i> .	38

2.3	Gametophytic Homomorphic S Systems with Polyallelic Series	39
2.3.1	One-Locus Stigmatic Control: the Case of the Style-Less Field Poppy	39
2.3.1.1	Genetics of SI Polymorphism in <i>P. rhoeas</i> and Other Species with Polyallelic, Monofactorial SI	40
2.3.1.2	The Number of S Alleles in <i>P. rhoeas</i>	42
2.3.2	Two Loci-Stigmatic Control in the Grasses	42
2.3.2.1	Breeding Efficiency of the S-Z System	43
2.3.2.2	The Size of Polyallelic Series	43
2.3.3	Four-Loci Stigmatic Gametophytic Control in the Ranunculaceae, the Chenopodiaceae and the Liliaceae	45
2.3.3.1	Few Alleles per Locus in Tetra-Factorial Stigmatic GSI	46
2.3.3.2	Linkage Between the Four SI Genes	47
2.3.3.3	SI is Maintained in Tetraploid <i>R. repens</i>	47
2.3.4	Monofactorial Stylar GSI with Polyallelic Series	47
2.3.4.1	The Size of Polyallelic Series in Stylar Monofactorial GSI	48
2.3.4.2	The Structure of the S Locus in Stylar Monofactorial GSI	49
2.3.4.3	Identification of S-Bearing Chromosomes	50
2.3.5	Bifactorial Stylar GSI with Epistatic Relationships	50
2.3.6	Three or Four S Loci in a Complementary System of <i>Lotus tenuis</i>	52
2.3.7	Ovarian Gametophytic SI	52
2.3.7.1	Post-Zygotic OSI?	53
2.3.7.2	Cyclic, Post-Zygotic, Polygenic SI	54
2.3.7.3	Incompatible Pollen Tubes That Prevent Ovule Development	54
2.4	Sporophytic-Gametophytic Systems	55
2.4.1	Three Genes Participate in the Ovarian Gametophytic-Sporophytic System of <i>Theobroma cacao</i>	55
2.4.2	Sporophytic Stigmatic SI Revisited in the Cruciferae and the Compositae	56
2.4.3	A One-Locus Sporophytic System with Traces of Gametophytic Pollen Control in the Caryophyllaceae	58

2.5	Genes Involved in the Rejection Phase of SI	59
2.5.1	In Stigmatic SI Systems	59
2.5.2	The Rejection Phase in Species with Stylar GSI	61
2.5.3	SI in the Ovary	61
2.6	SI in Polyploids	62
2.7	Equilibrium Frequencies of SI Alleles	62
2.7.1	Two Alleles at One Locus in a Sporophytic System	62
2.7.2	Trimorphism	63
2.7.3	One Polyallelic Locus in a Sporophytic System	63
2.7.4	Polyallelic Series in a Monofactorial Gametophytic System	64
2.7.5	Two Polyallelic Gametophytic Loci	64
2.7.6	The Number of Possible Allelic Combinations in <i>Theobroma</i>	65
2.8	The Maintenance and Efficiency of Incompatibility Systems	65
2.8.1	Population Sizes and Numbers of Incompatibility Alleles	66
2.8.1.1	Smallest Numbers of Alleles Required	66
2.8.1.2	“Molecular Restraints to the Coding Capacity of the S Gene in <i>Papaver</i> ”?	66
2.8.1.3	Consequences of High Numbers of Alleles at the SI Loci	67
2.8.1.4	Linkage Effect as a Main Cause to Unequal S-Allele Frequencies in British Populations of <i>P. rhoeas</i>	67
2.8.2	The Selection of Rare Alleles and Replacement Processes	67
2.8.3	Explanations to the Large Numbers of Alleles Found in <i>Oenothera</i> , <i>Trifolium</i> , <i>Carthamus</i> and <i>Lolium</i>	68
2.8.3.1	High Mutation Rates	68
2.8.3.2	Subdivisions of Populations	69
2.8.3.3	Migration and Hard Seed Carryover	69
2.8.4	The Efficiency of SI Mechanisms for Preventing Unions Between Near Relatives	70
2.8.4.1	A Comparison of Parent-Offspring Relationships in Heterostylic and Gametophytic Systems	70

2.8.5	Effects of Pollen and Seed Dispersal, Overlapping Generations and Plant-Size Variations in Populations at Equilibrium	71
2.8.6	A New Mathematical Approach to SI Polymorphism in a One-Locus Gametophytic System	71
2.8.7	The Concept of a Frequency-Equivalent Population	72
■ 3	Cellular and Molecular Biology of Self-Incompatibility	73
3.1	Heteromorphic Incompatibility	74
3.1.1	A System of Its Own	74
3.1.1.1	The Research Approaches are Different	74
3.1.1.2	Several Rejection Sites	74
3.1.1.3	Rejection Cascades	75
3.1.1.4	Stigmatic Rejection May Occur on Wet Stigmas	76
3.1.1.5	The Rejection Sites Are Not Always Typical of a Sporophytic System	76
3.1.1.6	The Incompatibility Loci Are Usually Di-Allelic	76
3.1.1.7	Role of the Internal Environment in the Specificity of Incompatibility Products	77
3.1.2	Occurrence and Function of Stigma and Pollen Polymorphism	78
3.1.2.1	Analyses of Pollen Walls	79
3.1.2.2	The Role of Pollen and stigma Dimorphism on Pollen Affixation and Pollen Metabolism	81
3.1.2.2.1	Effects of Differences in the Morphology of the Stigmatic Cuticle and in the Sculpturing of Pollen Exine	81
3.1.2.2.2	Function of the Pollen Exine in <i>Jepsonia</i>	83
3.1.2.2.3	Availability of Exudate on the Stigma Surface	83
3.1.2.2.4	Variations in Osmotic Pressures	83
3.1.3	The Molecular Biology of Heteromorphic SI	84
3.1.3.1	Identification of S-Recognition Factors	84
3.1.3.2	Is There a Fundamental Difference Between SI in Heteromorphic Species and SI in Sporophytic-Homomorphic Systems?	85
3.2	Homomorphic Sporophytic Stigmatic SI: the <i>Brassica</i> Type	87
3.2.1	Morphology and Structure of Stigma and Pollen Surfaces	87
3.2.1.1	The Stigma Surface	87
3.2.1.2	The Pollen Exine and the Pollen Coating	88

3.2.1.2.1	Differences in the Pollen Exine Sculpturing Between SSI and GSI	89
3.2.2	The Route of the Compatible Pollen Tube Through the Stigma	89
3.2.2.1	Self-Incompatible <i>Brassica oleracea</i>	89
3.2.2.2	Self-Compatible <i>Arabidopsis thaliana</i>	90
3.2.3	Stigmatic Proteins Involved in the Recognition of Incompatible Pollen	91
3.2.3.1	Immunological Detection and Purification of SLG	91
3.2.3.1.1	Purification of SLG	92
3.2.3.2	Essential Features of SLG	92
3.2.3.2.1	Cloning of the Gene Encoding SLG	92
3.2.3.2.2	The SLG Sequence	93
3.2.3.2.3	Structure of SLG and Homologies Between Alleles	94
3.2.3.2.4	Nature, Origin and Frequency of Sequence Variations Between Different Alleles	94
3.2.3.2.5	Co-Evolution of SLG and SRK	94
3.2.3.2.6	Structural and Functional Distinctness of SLG in Class-II Haplotypes	95
3.2.3.3	The S-Receptor Kinase Gene, SRK	95
3.2.3.3.1	Essential Features of SRK	96
3.2.3.4	A Direct Method for the Cloning of S Haplotypes	98
3.2.3.5	SLG and SRK Are Present, Often as Traces, in Other Parts of the <i>Brassica</i> and Transgenic <i>Nicotiana</i> Flowers	99
3.2.3.5.1	In the Pollen	99
3.2.3.5.2	In Anther Walls	99
3.2.3.5.3	In the Transmitting Tissue of the Stigma, Style and Ovary	99
3.2.3.5.4	In Transgenic Tobacco	99
3.2.3.6	A Putative Receptor Kinase Gene in <i>Ipomoea trifida</i>	99
3.2.3.7	SLG and SRK Have Many Relatives	100
3.2.3.7.1	Members of the S Multi-Gene Family That Are Linked to the S Locus	101
3.2.3.7.2	S-Locus-Related Sequences in <i>Arabidopsis</i>	102
3.2.3.7.3	Relationship of SRK/SLG to the Putative Kinase Receptor (ZmPK1) from Maize	102
3.2.3.7.4	ARC1, a Putative Downstream Effector for SRK	102
3.2.4	The S-Specific Pollen Determinant	102
3.2.4.1	Expected Features of the S Determinants	102
3.2.4.1.1	Allelism to the SRK or SLG Genes?	102

3.2.4.1.2	Likelihood of a Dimer Mechanism in SI Systems of the <i>Brassica</i> Type	103
3.2.4.1.3	Linkage of Pollen and Stigma Determinants to the S Haplotype	103
3.2.4.1.4	Sporophytic Expression	104
3.2.4.2	Contribution of the Tapetum to the Pollen Coat and to SI	104
3.2.4.2.1	Contribution to Pollen Coating	104
3.2.4.2.2	Evidence That the Pollen Coating Carries the Pollen S Determinant	104
3.2.4.2.3	Tapetal Origin of Pollen S Determinants?	105
3.2.4.3	The Search for the Pollen S Determinant: Recent History	105
3.2.4.3.1	The S-Glycoprotein-Like Anther Protein	106
3.2.4.3.2	The S-Locus Anther	106
3.2.4.3.3	Pollen-Coat Protein Class A	106
3.2.4.3.4	Pollen-Coat Protein A2	107
3.2.4.3.5	SLL2-S9 and S-Locus Anther-Expressed S9 Gene	107
3.2.4.3.6	The Systematic Analysis of S and S-Related Regions	107
3.2.4.4	Finding the Pollen Determinant	108
3.2.4.4.1	The Gene Fulfills the Requirements for the Hypothesized Pollen Determinant	108
3.2.4.4.2	SCR Is a Relative of PCPs	108
3.2.4.4.3	Origin (Sporophytic and Tapetal) of SCR	108
3.2.5	What Happens After an Incompatible Pollination?	109
3.2.5.1	Pollen Capture by the Stigma	109
3.2.5.2	Relationships Between Pollen Hydration and SI	110
3.2.5.3	Stigmatic S Glycoproteins Are Glycosylated ...	110
3.2.5.4	The Recognition of Incompatible Pollen	110
3.2.5.5	Rejection of Incompatible Pollen	112
3.2.5.6	The Role of Callose	112
3.3	Stigmatic Monofactorial Multiallelic GSI in <i>Papaver rhoeas</i>	113
3.3.1	Compatible and Incompatible Pollinations ...	113
3.3.1.1	Morphology and Growth of Compatible Pollen Tubes	113
3.3.1.2	Incompatible Pollen Grains and Pollen Tubes .	113
3.3.2	An In Vitro Bioassay for the Study of Stigmatic S Proteins – Pollen Metabolism and Pollen-Stigma Interactions after Self-Pollination	114

3.3.3	Characterization of Stigmatic S Proteins and Cloning of the Stigmatic S Gene	114
3.3.3.1	Isolation and Characterization of the Stigmatic S Proteins	114
3.3.3.1.1	Isolation and Testing of Function	114
3.3.3.1.2	Co-Segregation with S Alleles	114
3.3.3.1.3	Characteristics of the Protein	115
3.3.3.1.4	S Activity, S Specificity and the Role of Glycosylation	115
3.3.3.1.5	Polymorphism of S Sequences	115
3.3.3.1.6	The S Proteins Are Not Major Proteins of the Stigma	115
3.3.3.1.7	The S Protein Is Not a Ribonuclease	116
3.3.3.2	Cloning and Nucleotide Sequencing of the Stigmatic S Gene	116
3.3.3.3	Biological Activity of Mutant Derivatives of the S Protein	116
3.3.3.4	Large Numbers of ORFs with Homology to the Stigmatic S Gene of <i>Papaver</i> Are Present in the <i>Arabidopsis</i> Genome	117
3.3.4	Pollen Genes That Participate in the SI Response	117
3.3.4.1	Inhibition of Incompatible Pollen Tubes Depends on Pollen-Gene Expression	117
3.3.4.2	Involvement of a Signal-Transduction Mechanism in the SI Response	118
3.3.4.3	A Membrane Glycoprotein That Binds Stigmatic S Proteins in Pollen	119
3.3.4.4	Programmed Cell Death Is the End Point of the SI Response in <i>Papaver rhoeas</i>	121
3.4	Stigmatic Bi-Factorial GSI in the Grasses	121
3.4.1	Flowers and Pollination	122
3.4.1.1	Stigma and Pollen	122
3.4.1.2	Compatible Pollination	122
3.4.1.3	Self-Pollination	122
3.4.2	SI in <i>Phalaris coerulescens</i>	123
3.4.2.1	Identification of Restriction Fragments Linked to the Pollen S Gene	123
3.4.2.2	Bm2 is not the S Gene	123
3.4.2.3	Involvement of Thioredoxins in the SI Mechanism?	124
3.4.3	SI in Rye	125
3.4.3.1	Evidence that the SI Mechanism Involves Phosphorylation and Is Ca^{2+} Dependent	125
3.4.3.1.1	<i>In Situ</i> Pollen Phosphorylation	125

3.4.3.1.2	Gel Electrophoresis of Pollen Phosphoproteins	125
3.4.3.1.3	Effects of Inhibitors	126
3.4.3.2	A Model for the SI Mechanism in Rye	126
3.4.4	Applicability of the Model to All SI Species of Grasses	127
3.4.4.1	The S and Z Loci Are Not Interchangeable	127
3.4.4.2	Conserved S Sequences of <i>Brassica</i> Amplify S-Linked Fragments in Rye	127
3.5	Monofactorial Styler GSI with Multiple Alleles: the <i>Nicotiana</i> Type	128
3.5.1	Pollen-tube Morphology and Growth in Compatible Styles	128
3.5.1.1	Observation under the Light Microscope	128
3.5.1.1.1	Role and Specificity of the Stigmatic Exudate	129
3.5.1.1.2	Mitosis in the Generative Nucleus of <i>Petunia hybrida</i>	129
3.5.1.2	Electron Microscopy	129
3.5.2	Morphology and Growth of Incompatible Tubes	130
3.5.2.1	Incompatible Tubes of <i>N. alata</i> under Epifluorescence Illumination	130
3.5.2.2	Electron Microscopy	131
3.5.2.3	The Role of Callose	132
3.5.2.4	Mitosis in the Generative Nucleus of <i>P. hybrida</i>	132
3.5.3	Early Research on the Nature of the SI Reaction	133
3.5.3.1	SI as a Process of Growth Inhibition	133
3.5.3.2	Is the S Phenotype of Mature Styles Determined before Pollination?	133
3.5.3.2.1	Evidence from In Vitro Tests	133
3.5.3.2.2	Diverging Results	133
3.5.3.3	First Models of the Gametophytic Styler SI Mechanism	134
3.5.3.4	Towards the Detection of Styler S Proteins	135
3.5.4	Isolation, Cloning and Sequencing of a Styler Protein Segregating with the S2 Allele of <i>N. alata</i>	136
3.5.5	The S-Associated Glycoproteins Are Ribonucleases, and SI Involves the Degradation of Pollen RNA	137
3.5.6	Evidence that the S Proteins of <i>Petunia</i> and <i>Nicotiana</i> Are Responsible for the S-Allele-Specific Recognition and Rejection of Self Pollen	138

3.5.6.1	Induction of Loss and Gain of Functions at the S Locus of <i>P. inflata</i>	138
3.5.6.2	S-Allele-Specific Pollen-Tube Rejection in Transgenic <i>Nicotiana</i>	139
3.5.6.3	Proof that Ribonuclease Is Involved in the Rejection of Self Pollen	139
3.5.7	Main Features of the S-Ribonuclease Gene and of Ribonucleases	139
3.5.7.1	Distribution and Structural Features of the Gene	139
3.5.7.1.1	Solanaceae	140
3.5.7.1.2	Rosaceae	141
3.5.7.1.3	Scrophulariaceae	141
3.5.7.2	What Are the Effects of S Ribonucleases on rRNA and mRNA?	141
3.5.7.3	Are the Effects of Ribonucleases Irreversible? ..	142
3.5.7.4	Why Pollen Tubes Are Not Inhibited in the Stigma	143
3.5.7.5	What Determines the S Specificity of Stylar Ribonucleases?	143
3.5.7.5.1	The Role of the Carbohydrate Moiety	143
3.5.7.5.2	The Role of HV Regions	144
3.5.8	S-Gene Products in Pollen Grains and Pollen-Pistil Recognition	145
3.5.8.1	The S-Ribonuclease Gene Is Expressed in Developing Pollen Grains... ..	145
3.5.8.1.1	<i>N. alata</i>	145
3.5.8.1.2	<i>P. hybrida</i>	145
3.5.8.1.3	<i>L. peruvianum</i>	145
3.5.8.2	...but Pollen S Ribonucleases Do Not Determine the Pollen S Phenotype	145
3.5.8.3	Involvement of Protein Kinase?	146
3.5.8.3.1	A Pollen Receptor-Like Kinase 1 in <i>P. inflata</i> ..	146
3.5.8.3.2	In Vitro Phosphorylation of the S Ribonucleases from <i>N. alata</i>	147
3.5.8.4	The Role of Pollen Determinants	147
3.5.8.5	Current Research Regarding the Identification of Pollen S Determinants	149
3.5.8.5.1	A Functional Genome Approach to Search for the Pollen S Gene of <i>P. inflata</i>	149
3.5.8.5.2	Towards the Fine-Scale Mapping of the S Locus in <i>Petunia hybrida</i>	149
3.5.8.5.3	Use of a Two-Hybrid System to Identify the Pollen S Component in <i>S. chacoense</i>	149

■ 4	Breakdown of the Self-Incompatibility Character, S Mutations and the Evolution of Self-Incompatible Systems	151
4.1	The Physiological Breakdown of SI	152
4.1.1	Age Factors	152
4.1.1.1	Bud Pollination	152
4.1.1.2	Delayed Pollination, Use of Stored Pollen and End-of-Season Effects	153
4.1.2	Irradiation	153
4.1.2.1	Chronic Exposure to Low Dose Rates of Radiation	154
4.1.2.2	Acute Irradiation of Styles	154
4.1.2.3	High Temperatures	155
4.1.3	Application of CO ₂	156
4.1.4	Hormones and Inhibitors	156
4.1.4.1	α -Naphthalene Acetic Acid and Indole Acetic Acid	156
4.1.4.2	Effects of Transcription and Translation Inhibitors	157
4.1.4.3	Effects of Proteinase and Tunicamycin	158
4.1.4.4	Effects of Inhibitors of Protein Phosphatase ..	158
4.1.5	Pistil Grafting	159
4.1.6	Mutilations, Injections and the Effects of Castration on Pollen-Tube Growth	159
4.1.7	Mentor Effects	160
4.1.7.1	Mentor Pollen Is More Efficient When Inactivated or Killed	160
4.1.7.2	Nature of the Mentor Effects	161
4.2	Genetic Breakdown of SI and S-Gene Mutations ..	161
4.2.1	Loss of S Function in Pollen Grains of Species with SSI	161
4.2.2	Loss of S Function in the Pollen of Species with GSI	163
4.2.2.1	Function Loss of the Pollen Determinant Associated with the Presence of a Free Centric Fragment	163
4.2.2.1.1	Competitive Interaction	163
4.2.2.1.2	Complementation	165
4.2.2.1.3	Restitution	165
4.2.2.1.4	Likelihood of the Three Hypotheses	166
4.2.2.1.5	Origin of the Centric Fragment in "Pollen-Part" SC Mutants of <i>N. alata</i>	166

4.2.2.1.6	Current Approaches to the Biomolecular Study of PPMs Associated with Additional Chromosomal Material	166
4.2.2.2	Function Loss of the Pollen Determinant Not Associated with the Presence of a Centric Fragment	168
4.2.2.3	The Frequency of S Mutations Leading to the Loss of SI Function in Pollen Grains ...	169
4.2.2.4	Production of Cultivars with Modified Breeding Regimes: Examples of Traditional and Molecular Approaches	170
4.2.2.4.1	Cherry Stella	170
4.2.2.4.2	Elstar	170
4.2.2.5	The Use of “Pollen-Part” Mutations for the Production of F1 Hybrid Seed	171
4.2.3	Loss of S Function in the Stigmas of Species with SSI	172
4.2.3.1	Utility of SC Stylar Mutations and of Silencing Studies for the Understanding and Exploitation of SI	172
4.2.3.1.1	Breakdown of SI Through Silencing Effects ...	172
4.2.3.1.2	Why Gene Silencing Occurs	173
4.2.3.1.3	Scientific Interest of S-Gene Silencing	173
4.2.3.1.4	The Importance of Specific S-Function Losses for Basic and Applied Research	174
4.2.4	Loss and Gain of S-Function Approaches in the Stigma or Style of Species with GSI ...	174
4.2.4.1	SC Mutants Arising Spontaneously or from Conventional Mutagenic Treatment ..	174
4.2.4.2	Genetic Constructs and Ablations of S-Gene Products Leading to SC and their Importance for SI Research	175
4.2.4.2.1	How to Induce Function Loss Through the Use of Anti-Sense DNA	175
4.2.4.2.2	Loss of Function and Gain of Function Approaches Are Complementary	176
4.2.4.2.3	Competition Effects Occurring in the Styles of <i>Petunia</i> Plants with a Tri-Allelic S2–S3–S3× Genotype	177
4.2.4.3	Presence and Expression of S Ribonucleases in Self-Compatible Lines	177
4.2.4.4	Loss and Gain of Function in the Pollen of Plants with Mono-Factorial Stylar GSI	178
4.2.5	SC Through Genetic Changes Occurring Outside the S Locus	178
4.2.5.1	In Sporophytic Systems	179

4.2.5.2	In Gametophytic Systems	180
4.2.5.2.1	Mutations of Major Genes	180
4.2.5.2.2	Action of Polygenes	180
4.2.5.2.3	S Alleles Trapped in Translocation Rings	181
4.2.6	SC in Polyploids	182
4.2.6.1	Tetraploid Forms and Tetraploid Species Are Often Self-Compatible	182
4.2.6.2	Competitive Interaction in Diploid Hetero-Allelic Pollen	182
4.2.6.3	Effects of Polyploidy on SI in Monocots and Certain Primitive Dicots	183
4.2.7	The Generation of New SI Alleles	184
4.2.7.1	Conflicting Evidence Regarding the Role of HV Regions in the Solanaceae?	184
4.2.7.1.1	Only Four AAs Are Responsible for the Differ- ence in Specificity Between the S11 and S13 Alleles of <i>Solanum chacoense</i>	184
4.2.7.1.2	In <i>Petunia</i> and <i>Nicotiana</i> , the Ribonuclease Sequences Responsible for Pollen Recognition Appear to be Scattered Throughout the Molecule	185
4.2.7.2	New S Alleles Appear in Inbred Populations ..	187
4.2.7.3	Origin of New Specificities	188
4.2.7.4	The Dual Specificity of New S Alleles May Play a Key Role in the Generation of New S Alleles	188
4.2.7.5	The Role of the Genetic Background	189
4.2.7.6	Methods for a Rapid and Reliable Identification of S Alleles in Plant Breeding ..	189
4.3	Evolution of SI	190
4.3.1	Allelic Diversity	190
4.3.1.1	Origin, Distribution and Extent of Divergences among Functional S Alleles in the GSI System of the Solanaceae	191
4.3.1.1.1	Intragenic Crossing-Over or Accumulation of Single BP Changes?	191
4.3.1.1.2	Distribution and Variability of S Alleles	192
4.3.1.1.3	Inter-Species Variation in S-Allele Age and Number	192
4.3.1.2	S Alleles in Other Families with a Ribonuclease GSI System	192
4.3.1.2.1	Differences Between the Scrophulariaceae and the Solanaceae	192
4.3.1.2.2	Differences Between the Rosaceae and the Solanaceae	193
4.3.1.2.3	S-RNase Polymorphism in the Rosaceae	193

4.3.1.3	Homology or Convergence Among S Ribonucleases?	193
4.3.1.3.1	What Happens in Legumes?	194
4.3.1.4	SLG and SRK Allelic Divergences in the Brassicaceae	194
4.3.1.4.1	Hyper-Mutability of the S Locus	194
4.3.1.4.2	The S Locus is not a Hot Spot of Recombination	195
4.3.1.4.3	Distribution and Extent of Variations Between S Alleles	196
4.3.1.4.4	Extent of the Divergence Between SLG and SRK of a Same S Haplotype	197
4.3.1.4.5	How is Sequence Similarity Usually Maintained Between SRK and SLG in <i>Brassica</i> Haplotypes?	197
4.3.1.5	S Alleles Are Very Old	197
4.3.1.5.1	S-Ribonuclease Polymorphism in the Solanaceae Arose Before the Emergence of <i>Nicotiana</i> , <i>Petunia</i> and <i>Solanum</i>	198
4.3.1.5.2	The Origin of SLG and SRK	199
4.3.1.6	PCR Methods for Assessing Divergence Among S Alleles	201
4.3.1.6.1	In the Crucifers	201
4.3.1.6.2	In Solanaceous Species	201
4.3.2	The Multiple Origins of SI Systems	202
4.3.2.1	Early Views	202
4.3.2.1.1	SI is a Primitive Outbreeding Mechanism That Promoted the Expansion of Angiosperms	202
4.3.2.1.2	Gametophytic Poly-Allelic Incompatibility Is the Ancestral System and Occurred Only Once	203
4.3.2.2	Current Thoughts	203
4.3.2.2.1	Towards a General Agreement Regarding the Multiple Origins of SI	203
4.3.2.2.2	Multiple Gene Systems as an Origin of Mono-Factorial GSI?	204
4.3.2.2.3	S Ribonucleases Could Be Operating in a Very Vast Majority of Species from the Dicot Families	205
4.3.3	Origin of the Different Homomorphic SI Systems and Their Relationships	206
4.3.3.1	Origin of Stylar Mono-Factorial GSI and Properties of Allelic Genealogies at the GSI Locus	206
4.3.3.2	The Origin of SSI	207
4.3.3.3	Evolution of Inbreeding Depression and Its Importance for S-Allele Invasion	207
4.3.3.4	Transitions Between GSI and SSI	207

4.3.3.5	Co-Existence of SI and SC Alleles or Breakdown of the System?	208
4.3.4	The Origin of Heteromorphic Incompatibility	208
4.3.4.1	Arguments against Evolutionary Relationships with Homomorphic SI	209
4.3.4.1.1	Homomorphic SI Systems Probably Have Multiple Origins	209
4.3.4.1.2	Heteromorphic Incompatibility is Scattered Among the Angiosperms and Has Poly-Phyletic Origins	209
4.3.4.1.3	There Are Basic Differences Between Heteromorphic and Homomorphic SI	209
4.3.4.2	Which Came First, Heteromorphy or Incompatibility?	210
4.3.4.3	Evolution of Tristyly	211
4.3.4.4	The Evolutionary Breakdown or Transformation of Heteromorphy	211
4.3.5	SC as the “Paradox of Evolution”	212
4.3.5.1	The Derived Condition of SC	212
4.3.5.1.1	More Recent Arguments	213
4.3.5.2	Reasons for the Expansion of Self-Fertilizers	213
4.3.5.2.1	Outbreeding is not Always Essential Once the Environment has been Captured	214
4.3.5.2.2	Inbreeding-Outbreeding Alternations Provide Fertility Insurance	214
4.3.5.2.3	SC Facilitates the Establishment of Colonies after the Long-Distance Dispersal of Single Seeds	214
4.3.5.2.4	Self-Fertilizers Are Qualified Colonizers	214
4.3.5.2.5	Inbred Populations Display High Levels of Genetic Diversity	215
4.3.6	The Origin of Inter-Species Incompatibility	215

■ 5 Incompatibility and Incongruity Barriers Between Different Species 217

5.1	Inter-Species Incompatibility Under the Control of the S Locus	217
5.1.1	The SI×SC Rule	217
5.1.1.1	Distribution of the Barrier	218
5.1.1.1.1	In the Solanaceae	218
5.1.1.1.2	In Sporophytic Systems	218
5.1.1.1.3	The SI×SC Rule in the Grasses	219
5.1.2	Many Exceptions to the SI×SC Rule	219
5.1.2.1	They Occur Essentially in the Case of SI×SI Pollination	219

5.1.2.2	SI×“Sc” Crosses	220
5.1.3	Differences Between the SI Reaction and Inter-Species Rejection Processes	221
5.1.3.1	Situation in the Solanaceae	221
5.1.3.1.1	Observations with the Light Microscope	221
5.1.3.1.2	Electron Microscopy	222
5.1.3.2	In the Brassicaceae	222
5.1.4	The Involvement of the S Locus	224
5.1.4.1	Unilateral Pre-Zygotic Isolation Is an Active Process in <i>Brassica</i>	224
5.1.4.2	S _F , a Class of S Alleles That Clearly Display a Dual Function	224
5.1.4.3	Unilateral Pre-Zygotic Isolation Requires the Action of S-Ribonucleases in <i>Nicotiana</i> ...	225
5.1.5	S-Recognition Structures Participating in Inter-Species UI	227
5.1.5.1	The Antigen-Antibody Model	228
5.1.5.1.1	SI×SI Crosses	228
5.1.5.1.2	SI×Sc Crosses and Sc×SC Crosses	228
5.1.5.1.3	Actuality of the Model	229
5.1.5.2	The “Area Hypothesis”	229
5.1.5.3	The S Locus as a Cluster of Primary and Secondary Specificities	230
5.1.5.4	Why SI×SI Crosses Often Fail to Follow the SI×SC Rule	231
5.1.6	Other Genetic Loci Also Participate in Inter-Species Incompatibility	232
5.1.6.1	The R Locus of <i>Solanum</i>	232
5.1.6.2	A Switch Gene in <i>Lycopersicum</i>	232
5.1.6.3	The Two-Power Competition Hypothesis	234
5.1.6.4	Non-Functional and “Conditionally” Functional S Alleles in a SC Cultivar of <i>Petunia</i>	234
5.1.6.5	An Interaction Between the S Locus and Major Genes in <i>Lycopersicum pennellii</i> ? ..	235
5.2	Incongruity Between the Pollen and Pistil	236
5.2.1	What is Incongruity?	236
5.2.1.1	When Does it Start?	236
5.2.1.2	When Does it End?	237
5.2.2	Genetic Basis of Incongruity	238
5.2.3	Origin of Tissues and Genomes Involved in Incongruity	239
5.2.4	Justification of the Hypothesis	240
5.2.4.1	Arguments in Support of the Hypothesis	240
5.2.4.1.1	Pollen–Pistil Barriers Between SC Species	241

5.2.4.1.2	The Conditions that Overcome SI Often Have No Effect on Incongruity	241
5.2.4.1.3	The Genetics of Acceptance and Non-Acceptance	241
5.2.4.2	Questions Remain	242
5.3	The Removal of Pollen–Pistil Barriers Between Species	243
5.3.1	Intra-Species Inbreeding	244
5.3.2	Induced Mutations	245
5.3.3	Effects of Mentor Pollen	246
5.3.3.1	Can Mentor Effects on Self Pollen Consolidate Reproductive Barriers Between Species?	246
5.3.3.2	Nature of the Mentor Effects	246
5.3.4	Bud Pollination and the Action of Protein Inhibitors	247
5.4	Transfer of the S Gene to Autogamous Species	247
5.4.1	Introduction of the <i>Brassica</i> SLG and SRK Genes in SC Species	248
5.4.1.1	Transfer of SLG to <i>B. napus</i>	248
5.4.1.2	Transfer of SLG and SRK to <i>A. thaliana</i> and <i>N. tabacum</i>	248
5.4.2	Transfer and Expression of the S-Ribonuclease Gene in SC Species and SC Inter-Species Hybrids of <i>Nicotiana</i>	249
5.4.3	Other Genes Should Be Transferred with the S Gene	250
5.5	Reconstruction of Multigenic SI in SC Species	250
5.6	Crop Improvement Through the Transfer of Individual Genes	251
■ 6	Conclusions	253
6.1	High-Quality Research and Abundance of Achievements	253
6.1.1	High-Quality Research	253
6.1.2	An Abundance of Achievements: Classification, Distribution and Inheritance of Self-Incompatible Systems	253

6.1.3	Fine-Structure Studies of Pollen and Pollen Tubes in Compatible and Incompatible Surroundings	254
6.1.4	Identification of S Genes Active in the Pistil ..	254
6.1.5	Discovery of a Putative Pollen Determinant in the Cabbage Family	254
6.1.6	Progress Towards the Understanding of S Specificity	254
6.1.7	Advances in Cellular and Molecular Surgery ..	255
6.1.8	New Information Regarding the Evolution of SI Systems	255
6.1.9	Bypassing Pre-Zygotic Inter-Species Barriers ..	256
6.2	There Are Still Numerous Gaps in Our Knowledge and Skill	256
6.2.1	Unraveling the S-Gene Family	256
6.2.1.1	Genetic Control is More Complex Than Expected	256
6.2.1.2	The S-Gene Family of <i>Brassica</i> is Surprisingly Large	257
6.2.1.3	S-Locus Complexity Has Also Been Found in the Solanaceae	257
6.2.1.4	The S Alleles of <i>Papaver</i> May Also Belong to a Large Family	257
6.2.2	Analysis of Recognition and Rejection	257
6.2.2.1	Identification and Function of S and S-Related Proteins in the Pistil	257
6.2.2.2	The Search for Pollen Determinants	258
6.2.2.3	Identification of the Genes and Processes Affected by the Rejection Phase of SI	258
6.2.3	The Molecular Biology of SI in Heteromorphic Species	259
6.2.4	Barriers to the Expression of Transferred Genes	259
6.2.5	Evolution of SI	260
6.2.5.1	The Multiple Origin of Homomorphic SI	260
6.2.5.2	A Relationship Between GSI and Sporophytic SI?	260
6.2.5.3	A Multiple Gene System as the Starting Point for GSI	260
6.2.5.4	Is the Emergence of New S Alleles a Gradual Process?	261
6.2.5.5	Nature of the Relationship (Homology or Convergence) Between the S Proteins of the Different Families of Plants That Share a Common SI System	261
6.2.5.6	Evolution of Heteromorphic SI	261

6.2.6	Inter-Species Incompatibility and Incongruity .	262
6.2.6.1	The Complexity of Pollen–Pistil Barriers Between Species	262
6.2.6.2	The Need for Further Research on the Molecular Biology of Pre-Zygotic Barriers Between Species	262
6.2.6.3	Selection of Bridging Lines	263
■	References	265
■	Subject Index	309