Vowel Contraction

The three patterns of lengthening in Greek: simple lengthening, compensatory lengthening, and augmenting:

vowel	simple	compensatory	augment
ε	η	ει*	η
ο	ω	ου*	ω
α	ᾱ	ᾱ	η

* = spurious diphthong

Augment lengthing is used for:
+ historical augmenting (past tense)
+ lengthing contracting vowel in all principle parts but the first.

Simple lengthening is used for:
+ contraction of vowels

Compensatory lengthening is used for:
+ compensating for elision of consonants
+ contraction of omicron and epsilon

Rules of Contraction.

*** Rules for contracting single vowels:**
+ o-grade overrides.
+ e-grade with a-grade: grade of first vowel overrides.
+ The result (output) is always long:
  - compensatory lengthening if both vowels are ο or ε (the explicitly short vowels.)
  - else simple long

*** Rules for contracting diphthongs:**
+ Spurious diphthongs are contracted like their corresponding short vowel. (The close vowel of a spurious diphthong isn't really "there".)
+ a vowel contracts with a diphthong by contracting with its first vowel.
+ The one exception to these rules is that ο+η −> οι in contract verbs (but it can also give ῳ as these rules would predict).

Contraction Tables.

I believe that these rules explain the possible contractions of vowels:

Contractions of single vowels:

	α	ε	η	ο	ω	ι	υ
α	ᾱ	ᾱ	ᾱ	ω	ω	αι	αυ
ε	η	**ει***	η	**ου***	ω	ει	ευ
η	η	η	η	ω	ω	ῃ	ηυ
ο	ω	**ου***	ω	**ου***	ω	οι	ου
ω	ω	ω	ω	ω	ω	ῳ	ωυ

Contractions with diphthongs:

	αι	ει	ει*	ῃ	οι	ου*	ῳ
α	ᾳ	ᾳ	α	ᾳ	ῳ	ω	ῳ
ε	ῃ	ει	ει*	ῃ	οι	ου=	ῳ
η	ῃ	ῃ	η	ῃ	ῳ		ῳ
ο	ῳ	οι	ου=	**οι/ῳ**	οι	ου*	ῳ

Key:
ει*, ου*: spurious diphthong
ου=: Smyth does not appear to specify whether these are genuine or spurious diphthongs. It probably doesn't matter.
(blank): Evidently no example of this occurs in Greek.

Notes:
According to Smyth, ε and ο were closer vowels than η and ω. (This is difficult for English speakers to reproduce, since our long vowels tend to be closer than our short vowels.) Knowing this makes the behavior and the orthography of the spurious diphthongs more natural and understandable.