# Summary of Cryptic Crosswords

## Cryptic Crosswords In general

## Cryptic Crosswords in the Literature

While not a topic well covered in scientific literature in general, what few analytical studies around cryptic crosswords there are tend to be classifiable into three main groups:

The largest body of work that exists is centred around the generation of cryptic clues, focused largely around analysis of how string literals from a pre-determined answer can be transformed by set clueing patterns, as well as some work around measures of the quality of generated clues.

The next set are the select few who have done prior, similar investigations into solving cryptic clues, with some work put into formalising definitions and notation for the sorts of clue types that appear in the majority of cryptic crosswords, and some attempts at solving. There has also been some work done towards solving non-cryptic crosswords probabilistically, working on whole-grid solutions rather than individual clues.

There are also some more left-of-field studies done: statistical studies into errors made during manual solving, and psychological studies into solving.

## Formalisation

# The Cryptic Crossword

## Metasyntactic Conventions

Here we apply a similar convention to Hart, in using a modified Backus Naur Form (BNF). We will later see that a context-free grammar may not be sufficient to model a cryptic crossword, and may have further deficiencies as a basis for finding a solution. Nevertheless, we will adopt a similar notation:

→ = is composed of

, = followed by

| = or

(x) = x is optional

x\* = 1 or more occurrences of x

(x)\* = 0 or more occurrences of x

We also take the BNF conventions

word = non-terminal symbol

“word” = string literal

[x, y, z] = list containing x y and z

(x, y) = pair x and y

For clarity, we additionally define:

{words} = English word including semantic meaning

For this last one, we really mean that we can still use the word in a synonym equivalence relationship.

## Structure of a cryptic clue

A cryptic crossword differs from a normal crossword in that the clue for each answer consists of two parts.

The first is the definition, which performs the same function as a clue in a 'regular' crossword. The answer to the clue is usually a synonym for the definition ('circular' and 'round') or may be an example of the definition ('farm animal' and 'pig'). Other forms that the definition may take will be discussed later on.

The second part of the clue is the wordplay. This is an encoded and often ambiguous second method of deriving the answer, using techniques such as anagram, substitution and concatenation.

The clue as a whole is presented as a concatenation of the two parts, sometimes with a subsidiary word indicating that one can be derived from the other (for example, 'from' or 'is').

We can present this breakdown as:

Clue → Definition, (Indicator)\*, Wordplay   
 | Wordplay, (Indicator)\*, Definition

The final clue will often resemble a valid English utterance, although this 'surface reading' (i.e. {clue} ) very rarely has any relation to the answer.

Later on we will consider other information and context within the definition of a clue.

## Definition

The definition of the clue consists of one or more English words. The answer to the clue will be a word or phrase that fits an appropriate equivalence function. Usually, the words are synonyms:

{allies} = “Friends”

although sometimes the relation is an ‘example of’ relation.

{country} = “France”

The definition carries a variety of linguistic features with it that the overall answer, and so the answer as derived by the wordplay, must match. These include aspect (noun, verb, adjective), plurality (tree, trees), tense (go, going, gone). These features may also be considered as context to the clue itself.

## Formally

We can define the definition as

Definition → {Word}

## Wordplay

The wordplay section of a clue is a set of deliberately ambiguous instructions that allows the solver to arrive at the eventual answer. As the instructions are ambiguous, multiple possible parsings of the instructions are possible. Some of these parsing will not lead to a valid English word:

Imbecile, bonkers, in a cult (7)

⇒ Wordplay ‘Imbecile, bonkers = definition ‘in a cult’

⇒ Anagram ‘imbecile’ [indicator = bonkers] = definition ‘in a cult’

⇒ ??? (no anagrams of imbecile)

(correct reading was anagram

Others will lead to a valid English word, but one that is not equivalent to the definition:

Minder shredded corset (6)

⇒ Wordplay ‘minder shredded’ = Definition ‘corset’

⇒ Anagram ‘minder’ [indicator = shredded] = Definition ‘corset’

⇒ ‘remind’ = Definition ‘corset’ X

(correct reading was anagram ‘corset’ = escort = minder)

The solver must find the correct parsing of the wordplay that yields the correct definition: even though they may not know which part is wordplay and which is definition.

## Wordplay Types

Some sort of leadup

Wordplay → ClueType

## Unitary Operators

**Anagram**