Analogy

The formula of analogy is as follows:-

S', S'', and S''' are taken at random from such a class that their characters at random are such as P', P'', P'''.
t is P', P'', and P'''.
S', S'', and S''' are q;
$\therefore$ t is q.

Such an argument is double. It combines the two following:-

1

S', S'', S''' are taken as being P', P'', P'''.
S', S'', S''' are q.
$\therefore$ (By induction) P', P'', P''' is q.

t is P', P'', P'''.
$\therefore$ (Deductively) t is q.

2

S', S'', S''' are, for instance, P', P'', P'''.
t is P', P'', P''';
$\therefore$ (By hypothesis) t has the common characters of S', S'', S'''.

S', S'', S''' are q.
$\therefore$ (Deductively) t is q.

Owing to its double character, analogy is very strong with only a moderate number of instances.

The argument from analogy, which a popular writer upon logic calls reasoning from particulars to particulars, derives its validity from its combining the characters of induction and hypothesis, being analyzable either into a deduction or an induction, or a deduction and a hypothesis.

... But in what is known as "reasoning from analogy," the class sampled is small, and no instance is

taken twice. For example: we know that of the major planets the Earth, Mars, Jupiter, and Saturn revolve on their axes, and we conclude that the remaining four, Mercury, Venus, Uranus, and Neptune, probably do the like. [—] Our premisses here are that the Earth, Mars, Jupiter, and Saturn are a random sample of a natural class of major planets–a class which, though (so far as we know) it is very small, yet may be very extensive, comprising whatever there may be that revolves in a circular orbit around a great sun, is nearly spherical, shines with reflected light, is very large, etc. Now the examples of major planets that we can examine all rotate on their axes; whence we suppose that Mercury, Venus, Uranus, and Neptune, since they possess, so far as we know, all the properties common to the natural class to which the Earth, Mars, Jupiter, and Saturn belong, possess this property likewise. The points to be observed are, first, that any small class of things may be regarded as a mere sample of an actual or possible large class having the same properties and subject to the same conditions; second, that while we do not know what all these properties and conditions are, we do know some of them, which some may be considered as a random sample of all; third, that a random selection without replacement from a small class may be regarded as a true random selection from that infinite class of which the finite class is a random selection. The formula of the analogical inference presents, therefore, three premisses, thus:

S', S", S"', are a random sample of some undefined class X, of whose characters P', P", P"', are samples,
Q is P', P", P"';
S', S", S"', are R's;
Hence, Q is an R.

We have evidently here an induction and an hypothesis followed by a deduction; thus:

Every X is, for example, P', | S', S", S"', etc., are samples
P", P"', etc., | of the X's,
Q is found to be P',P",P"', | S', S", S"', etc., are found
etc.; | to be R's;
Hence, hypothetically, Q is | Hence, inductively, every X
an X. | is an R.

Hence, deductively, Q is an R.

An argument from analogy may be strengthened by the addition of instance after instance to the premisses, until it loses its ampliative character by the exhaustion of the class and becomes a mere deduction of that kind called *complete induction, in* which, however, some shadow of the inductive character remains, as this name implies.

1896 [c.] | Lessons of the History of Science | CP 1.65-69

There are in science three fundamentally different kinds of reasoning, Deduction (called by Aristotle {synagögé} or {anagögé}), Induction (Aristotle's and Plato's {epagögé}) and Retroduction (Aristotle's {apagögé}, but misunderstood because of corrupt text, and as misunderstood usually translated *abduction*). Besides these three, Analogy (Aristotle's {paradeigma}) combines the characters of Induction and Retroduction.

Analogy is the inference that a not very large collection of objects which agree in various respects may

very likely agree in another respect. For instance, the earth and Mars agree in so many respects that it seems not unlikely they may agree in being inhabited.

1898 | Cambridge Lectures on Reasoning and the Logic of Things: Types of Reasoning | RLT 141

For the sake of brevity I have abstained from speaking of the argument from analogy, which Aristotle terms [paradeigma]. I need hardly say that the word analogy is of mathematical provenance This argument is of a mixed character being related to the others somewhat as the Fourth Figure of syllogism is related to the other three.

1900 | Smithsonian Institution letters | HP 2:876-877

In 1867, I produced what I considered, and still consider proof that all arguments are of three kinds Deduction, Induction and Hypothesis, with a supplementary kind Analogy sharing in the nature of Induction and of Hypothesis.

1902 | Probable Inference | CP 2.787

Among probable inferences of mixed character, there are many forms of great importance. The most interesting, perhaps, is the argument from Analogy, in which, from a few instances of objects agreeing in a few well-defined respects, inference is made that another object, known to agree with the others in all but one of those respects, agrees in that respect also.

1902 | Carnegie Institution Correspondence | NEM 4:38

... Besides these three types of reasoning there is a fourth, Analogy, which combines the characters of the three, yet cannot be adequately represented as composite. ...

1911-01 | Notes for my Logical Criticism of Articles of the Christian Creed | CP 7.97-98

... all Reasoning is either Deduction, Induction, or Retroduction.

[—] I have constantly since 1860, or 50 years, had this question prominently in mind, and if I had ever met with an argument not of one of these three kinds, I must certainly have perceived it. But I never have found any such kind of argument except Analogy, which, as I have shown, is of a nature, – a mixture of the three recognized kinds.