THE LOGIC OF SCIENTIFIC DISCOVERY
IN CRITICAL REALIST SOCIAL SCIENTIFIC RESEARCH[1]

BY

JAN J. J. M. WUISMAN

Abstract. Critical realism claims to bring a significant improvement to social science, especially in comparison with empiricist and interpretive approaches. So far, however, it has fallen short of the high expectations it raises. Critical realist arguments are convincing on the philosophical or meta-theoretical level but the contributions of critical realism to social science in terms of research activities at the field level are less clear. Nonetheless, there is no way back. Moving forward requires that the practice of doing social scientific research be no longer perceived as limited to the justification of specific knowledge claims but must be seen as an integral part of the cycle of scientific discovery.

Key words: critical realism, data, explanation, cycle of discovery, validation, research practice

> The proof of the pudding is in the eating.
> —Anon.

1. *Introduction*

According to some prominent representatives of the critical realist approach to social science a big gap remains between the philosophical and methodological ideas of this approach and the more practical aspects of doing research.[2] In order to bridge this gap not only must a lot of practical hurdles be overcome, but also a number of more fundamental problems need

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[2] Margaret Archer, et al., eds, *Critical Realism: Essential Readings*, London: Routledge, 1998; Tony Lawson, *Economics and Reality*, London: Routledge, 1997; Andrew Sayer, *Realism and Social Science*, London: Sage, 2000.

to be solved. This article addresses one problem social scientists face when explicitly trying to follow critical realist principles in undertaking research: the role played by the various modes of logical inference in social scientific research, particularly that of induction, deduction, and abduction (or retroduction). The thesis advanced here is that critical realism can be put to work more fruitfully for the social sciences if the role of the various modes of logical inference is not analyzed within the limited confines of the context of justification of specific knowledge claims, but within the much broader and more encompassing framework of the cycle of scientific discovery.

1.1. *The problem*

Discussions about the role of the various modes of logical inference in social scientific research based on critical realist principles focus on the question: What logic of inquiry is required for developing valid explanations of social reality? Following this question, they primarily focus on the strengths and weaknesses of various modes of inference as a means of justification.[3] The impression that emerges from this focus is that the logics of induction and deduction are less useful for the development of valid scientific explanations of social reality than those of retroduction and abduction. To reach this conclusion a number of arguments are made. The first is about induction and easiest to understand: induction is viewed as inferring propositions about general regularities or universal laws from a limited set of sensory observations; it is described as a kind of logic which cannot produce valid scientific knowledge; and, the argument maintains, no amount of sensory observations will suffice to draw valid universal conclusions about social reality. The second argument addresses deduction. Deduction is described as playing a pivotal role in the attempt to produce valid scientific knowledge in the form of deductive-nomological theories. These theories attempt to explain and predict particular empirical phenomena by deducing them from a set of propositions about general regularities or universal laws and precisely specified initial conditions. However, the

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[3] Margaret Archer, et al., eds, *Critical Realism: Essential Readings*, London: Routledge, 1998; Andrew Collier, *Critical Realism: An Introduction to Roy Bhaskar's Philosophy*, London: Verso, 1994; Berth Danermark et al., *Explaining Society: Critical Realism in the Social Sciences*, London: Routledge, 2002, pp. 79-106; Andrew Sayer, *Method in Social Science*, London: Hutchinson, 1984/1992, pp. 153-9, 169-73, 226-8; *Realism and Social Science*, London: Sage, 2000.

Layers of reality	Positivist/ empiricist approach	Interpretive constructivist approach	Critical realist approach
1	Empirically observed characteristics	Symbolically expressed meanings	The empirical (experiences)
2			The actual (events)
3			The real (mechanisms)

Figure 1. The ontological conception of social reality

argument suggests, the search for general regularities and universal laws in empirical reality is in vain; so far none have been found. Other arguments put forward are about ontology. Induction and deduction are almost invariably associated with the empiricist and interpretive approaches to social scientific research and a conception of social reality as consisting of a single layer. According to the empiricist approach social reality is equal to all that is empirically observable; according to the interpretive approach it is equal to all symbolic meanings. In contrast, the critical realist approach to social scientific research starts from the ontological notion that social reality is stratified. In critical realist literature three hierarchically arranged layers are distinguished: the empirical, the actual and the real, at which experiences, events and mechanisms are, respectively, situated (see Figure 1).[4]

This critical realist ontology implies that social reality is neither equal to nor explainable exclusively in terms of the empirical. Instead, scientific explanation of social phenomena necessitates a search in the underlying

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[4] Roy Bhaskar, *The Possibility of Naturalism: A Philosophical Critique of the Contemporary Social Sciences*, London: Routledge, 1979/1998, p. 51.

layers of reality for specific mechanisms that generate the particular events actually taking place and which, in turn, to a greater or smaller extent, may be experienced through the senses. At this point retroduction and abduction are introduced. These are viewed as the modes of inference specifically required to explore underlying levels of reality and uncover their mechanisms and events. Induction and deduction are considered of little or no use to this specific endeavour. Instead, they tend to be either looked upon as belonging to the preliminary stages of research and fulfilling a complementary role to other modes of inference, or considered of secondary importance to the practice of social research compared to the logic of retroduction and abduction.[5]

Is it true that induction and deduction have no crucial role to play in social scientific research? Is the answer to this question a simple yes or no, or is it a question of how and when? According to the author the four modes of inference mentioned can be approached from at least two different perspectives. First, they can be viewed as completely independent forms of reasoning; induction, deduction, retroduction and abduction represent four different logics of inquiry, each with its own merits and shortcomings. This perspective dominates discussions of this topic in critical realism.[6] Second, in contrast, the various modes of inference can be viewed as elements or parts of a larger whole and related to each other in a special way. In this case not four but only three different modes of inference should be distinguished: induction, deduction and abduction, retroduction being a synonym of abduction.

In this article it will be argued that in social scientific research based on critical realist principles, both induction and deduction are in fact basic elements of research and of equal importance to abduction or retroduction, albeit in a completely different role to that usually attributed to them. In order to demonstrate this point, the following discussion focuses on the role played by the various modes of inference in the process of social scientific research based on a critical realist approach.

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[5] Berth Danermark, et al., *Explaining Society: Critical Realism in the Social Sciences*, London: Routledge, 2002, p. 75; Andrew Sayer, *Method in Social Science*, London: Hutchinson, 1984/1992; *Realism and Social Science*, London: Sage, 2000, pp. 19-22.

[6] Berth Danermark, et al., *Explaining Society: Critical Realism in the Social Sciences*, London: Routledge, 2002, pp. 80-1. A discussion along similar lines is found in Norman Blaikie, *Approaches to Social Enquiry*, Oxford: Blackwell, 1993; *Designing Social Research: The Logic of Anticipation*, Cambridge: Polity Press, 2000.

Before doing so, it is necessary to state explicitly how a number of critical realist terms will be used. I adopt the metaphor of levels of reality and differentiate only between three hierarchically arranged horizontal layers because these are widely used in critical realist discourse. In addition I associate each of these layers with a distinct category of ontological phenomena: experiences (top layer), events (intermediate layer) and mechanisms (lowest layer). In contrast to critical realist discourse, however, these layers will not be labelled with the terms empirical, actual and real but rather with the numbers 1, 2 and 3. This is because the labels 'empirical', 'actual' and 'real' do not refer to three different, mutually exclusive categories but to three overlapping sets or domains. The category of experiences comprises all that can be observed through the senses. As such this category coincides perfectly with the domain of the empirical. The domain of the actual, though, comprises not only the category of events, but also that of experiences. The domain of the real, finally, includes all three categories of ontological phenomena. Using these domains in the sense of homogeneous, independent, mutually exclusive categories or layers of reality is thus erroneous.

1.2. *The approach*

To paraphrase the proverb beginning this article, the proof of critical realism is in the practice of social scientific research. Accordingly, the topic of this article is not approached in the conventional way. Instead of taking the reader on a diversion along a broad range of ideas and theories in the philosophy and methodology of the social sciences, I prefer to place the reader face-to-face with a small set of data (in § 2) which are to be explained in a critical realist manner. This data relates to a commonplace phenomenon: the custom of the Rejang people in Sumatra of cooking a side dish on the occasion of marriage ceremonies. What is surprising about this custom is the surprising variety of ways in which it is practiced. Simple as the case might seem, finding a proper explanation and understanding of the phenomenon is anything but easy. Without an approach based on critical realist principles one cannot get far. That is why the reader is taken first along the road the author himself has followed in search of a solution. It will be shown how various attempts to explain and understand the phenomenon failed and why the endeavour ended in deadlock. What at first sight appears a very simple customary cooking practice gradually became something of a mystery. In order to find a way forward the entire conceptual framework on which the author's approach was based had to

be reconstructed and redefined from a different perspective. Accordingly, the key concepts of a critical realist approach to the problem are presented in § 3: data, explanation, logic of inquiry and validation. These concepts are closely related to each other. The concept of explanation is defined in similar if not identical terms to that found in the literature on critical realism. However, the meaning of the concepts of data, logic of inquiry and validation differs from that literature. After the key concepts of the conceptual framework have been elaborated, a solution to the cooking mystery from a critical realist perspective is suggested in § 4. It is not being claimed that this solution represents the final word on the case; the validity of the explanation and understanding suggested is not a question of being plainly true (valid) or untrue (invalid), but of being right or wrong, and to what extent.

The specific purpose of this article is to present an example of what an explanation and understanding of a set of data about a social phenomenon from the perspective of critical realism might look like. Unfortunately, classic examples are still very rare.[7] In most cases the discussion is primarily focussed on the philosophy of science and methodological aspects. How, from a critical realist perspective on social scientific research, data and explanation are related to each other, and what logic of inquiry is required to reach that goal, are not usually specified in detail. The only way to get a full taste is in the eating.[8]

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[7] Examples of critical realist social scientific research are discussed in, among other places, Sam Porter, 'Critical realist ethnography: the case of racism and professionalism in a medical setting', *Sociology* vol. 27, no. 4, pp. 195-211; Roy Nash, 'Social explanation and socialization: on Bourdieu and the structure, disposition, practice scheme', *The Sociological Review*, vol. 51, no. 1, pp. 43-62; Andrew Sayer, *Realism and Social Science*, London: Sage, 2000, pp. 22-6; Ray Pawson and Nick Tilley, *Realist Evaluation*, London: Sage, 1997, pp. 78-82, 89-114; Ray Pawson, 'Middle-range realism', *Archives Européennes de Sociologie*, vol. 41, no. 2, pp. 283-325.

[8] The critical realist approach to social science first came to the author's serious attention in 1998, after which the possibilities and limitations for doing social scientific research based on the principles of critical realism were systematically explored. To this end an in-depth analysis was made of 50-60 small-scale research projects carried out under the author's supervision by students in the context of a number of courses offered by the Department of Public Administration, Leiden University. The topics studied varied considerably and ranged from micro to macro levels of analysis. All research projects were designed in accordance with critical realist principles. The objective in each case was to develop an explanation of the phenomenon of interest in terms of the underlying mechanism and test it. Based on that experience an ongoing series of

2. *Goats' Heads Tossing in a Cauldron*

In order better to understand the various modes of inference from a critical realist perspective let us first travel to Bengkulu, a former British colony on the south-west coast of Sumatra, Indonesia. There live the Rejang, a people described in 1783 by the Englishman William Marsden in his book *History of Sumatra* as exemplary for all peoples on the island of Sumatra.[9]

2.1. *The set of data*

During my research among the Rejang from 1976 to 1979 I was frequently invited as a guest to attend marriage ceremonies. I noticed that while on some occasions two goats' heads were being cooked in a big cauldron for a side dish, on other occasions there was only one.[10]

2.2. *The king's road to explanation*

Being thoroughly trained in the empiricist methodology of social scientific research, I began thinking of the content of the cauldron as a dependent variable that might be explained by relating it to some other factors, the so-called independent and intervening variables.[11] The basic question I needed to answer was: Which variables, and, what kind of relationship? Knowing the difference between the amount of food usually being consumed by a single person compared to that of a large crowd, it was only a small step to come up with the following syllogistic deductive-nomological explanation for this remarkable cooking phenomenon:

– For all marriage ceremonies among the Rejang the following holds true: if the number of guests is large then the number of goats' heads being cooked in the cauldron is two, and, conversely, if the number of guests is small then the number of goats' heads in the cauldron is one.

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masters thesis research projects on a wide variety of topics has been conducted on critical realist principles. The re-conceptualization of the logic of social scientific research in terms of a cycle of discovery presented in this article is the outcome of this research work.

[9] William Marsden, *History of Sumatra*, London: Thomas Payne, 1783.

[10] Jan J. J. M. Wuisman, *Sociale Verandering in Bengkulu* (*Social Change in Bengkulu*), Dordrecht: Foris Publications, 1985.

[11] Adriaan De Groot, *Methodology: Foundations of Inference and Research in the Behavioural Sciences*, The Hague: Mouton, 1969; Walter Wallace, *The Logic of Science in Sociology*, Chicago, Il: Aldine, 1971.

– On the occasion of marriage ceremony A among the Rejang of village community N, the number of guests is large, goat's head is on the menu for the occasion, and goats' heads are cooked in a cauldron.
– Therefore: there will be two goats' heads tossing in the cauldron.

This explanation for the fact of one or two goats' heads tossing in a cauldron can very easily be inflated to a full-fledged syllogistically ordered deductive-nomological theory by relating it to the following general regularity or universal law:

– For all human groups the following holds true: demand determines supply.
– Demand increases as the number of people increase, marriage ceremonies among the Rejang are occasions at which the number of people increases, supplies can be provided proportionate to the size of demand, consumption goods, such as goats' heads, are a kind of supply that can meet a demand proportionate to the size. Marriage ceremonies among the Rejang are occasions at which the number of people increases. Supplies can be provided proportionate to the size of demand. Consumption goods, such as goats' heads, are a kind of supply that can meet a demand proportionate to the size.
– Therefore: for all marriage ceremonies among the Rejang the following holds true: if the number of guests [. . .]

What makes this cooking custom of the Rejang so interesting is not the fact that I never attended a marriage ceremony at which more than two goats' heads were being cooked in the cauldron, but that this easy-to-grasp theory proved to be entirely wrong. The empirical test this theory was submitted to revealed that actually the opposite was the case. Stated formally: for all observed marriage ceremonies among the Rejang the following holds true: if the number of guests is large, then the number of goats' heads being cooked in the cauldron is just one, and conversely, if the number of guests is relatively small, then the number of goats' heads being cooked in the cauldron is two.

That means, instead of a positive relationship between the independent and dependent variable a negative one was found. For the author, of course, this outcome was a totally unexpected discovery. But old thinking habits, deeply inculcated in one's psyche as a result of arduous instruction by a number of renowned professors, are very difficult to overcome. That is why I went on to devise another deductive-nomological theory that could explain the negative relationship. The reasoning required to solve the

mystery of the Rejang marriages seemed quite simple: if people—who actually are very poor and in great need of a tasty and healthy meal at that—don't show up at an occasion when food is free and served in greater quantities but instead come in greater numbers when less of that food is being prepared, then there must be something terribly wrong. Perhaps the marriage is against the rules! The reason for thinking this was that I had noticed that the Rejang marry according to the rules of Islamic marriage law. In addition, during an informal conversation with an informant I learnt that cooking two goats' heads was 'a fine' imposed on a wrongdoer who had breached the rules. Although I thought of the obligation to slaughter goats as a very odd sort of fine, I didn't reflect on it any further. For, as we know from Marsden's stay in Bengkulu in the 1770s, the Rejang people have many customs strange to the outside observer. One more oddity simply makes them even more interesting, especially from a social anthropological viewpoint. Further, I reasoned that in the case of a marriage in breach of Islamic marriage law the families involved might feel ashamed and try to carry out the ceremony with as little pomp and circumstance as possible. In addition, acquaintances and fellow villagers without close relations to the families involved might hesitate to visit such a blemished occasion. Reasoning along these lines I soon came up with the following new, syllogistic deductive-nomological explanation:

- For all marriage ceremonies among the Rejang the following holds true: if the marriage is in conformity with the rules of Islamic marriage law, then the number of goats' heads being cooked in the cauldron is just one, and conversely, if the marriage is in breach of the rules of Islamic marriage law, then the number of goats' heads in the cauldron is two.
- On the occasion of marriage ceremony A among the Rejang of village community N the marriage is not in conformity with the rules of Islamic marriage law, there is goat's head on the menu for the occasion, and goats' heads are cooked in a cauldron.
- Therefore: there will be two goats' heads tossing in the cauldron.

Unexpectedly, this explanation also did not stand the rigorous empirical test it was subjected to. There proved to be no relationship whatsoever between being in accordance with the rules of Islamic marriage law and the number of goats' heads in the cauldron. In all cases the marriage proved to be performed in conformity with the rules of Islamic marriage law. In addition, if taken literally the explanation is a nonsensical one. It

assumes a relationship between the obligation to slaughter goats and a marriage being in conformity with the rules of Islamic marriage law or not. Since at every Rejang marriage ceremony at least one goat is slaughtered, the explanation implies that all marriages are to some degree not in conformity with the rules of Islamic marriage law.

2.3. *The deadlock*

To recap, I tried to find a justification for a proposition about some empirical findings by establishing a direct relationship between the data and a theory in a series of related steps. First, based on a number of sensory experiences with differing numbers of goats' heads tossing in various cauldrons, I conceived of the concept of 'goats' head cooking' with the values one and two. Next, I tried to find an explanation for the variation in the number of goats' heads being cooked. From an empiricist perspective 'to explain' means, first, to relate the dependent variable to a certain independent variable. The following step in the process of relating the data to a theory is that of developing a deductive-nomological explanation by subsuming the 'established' empirical relationship between the dependent and independent variable (explanandum) under a proposition about some general regularity or universal law (explanans) formulated in terms of abstract, theoretical concepts in such a way that the relationship between the two kinds of proposition meets all requirements of a logically valid deductive argument.

The example shows that the requirement of establishing a valid relationship between a set of data and a theory is very difficult to meet. Social reality is infinitely varied and up to now no universal deterministic relationships have been found. If it is not possible to produce a valid justification within the empiricist approach to social science, then what options are left for proceeding? One such option is what Karl Popper called the 'conventionalist salvage strategy', that is, first, to restate the hypothesis about a relationship between variables to be tested in terms of the empirical results obtained, as is done in the example; and, second, to moderate one's demands in regard to the relationship between the data and theory. Replacing a statistical inductive argument for the deductive argument does the latter. These adaptations imply an increase in 'empirical content' of the hypothesis and explanation, as well as a decrease in its explanatory scope and falsifiability. This is precisely what Popper calls to follow the well-

trodden path of 'going backward'.[12] The other option is to take the inter-
pretive approach to social theory development. This proceeds from sen-
sory experiences to abstract theory through a process of concept formation
and theorizing based on theoretical induction. At first sight this second
path looks totally different from the empiricist methodology. Nevertheless,
the objective being pursued is exactly the same, namely to find a justification
for the empirical findings by establishing a direct relationship between them
and an abstract theory. It is here that the empiricist as well as the inter-
pretive approach to social scientific research runs into problems.

2.4. *The way forward*

The only possible way to move forward is to break out of the very lim-
ited confines of a context of justification constituted by an inductive or
deductive relationship between data and theory. It is precisely to this prob-
lem that the critical realist approach to social science seems to offer a solu-
tion. This basically consists of taking retroduction and abduction for induction
and deduction as the main mode of inference in theory development.
Unfortunately, as will be demonstrated, a shift from one mode of infer-
ence to another is not what is required because thereby the conventional
conception of doing social scientific research and the role attributed to the
methods of research in the process of developing scientific knowledge do
not change. Instead, what is needed is a shift in conception of the frame-
work of doing research from that of a context of justification of knowl-
edge claims to that of an iterative cycle of scientific discovery including
induction, deduction and abduction.[13] This, however, requires the re-con-
ceptualization of four closely related key-concepts of social scientific research:

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[12] According to Popper scientific progress can only be achieved by creating a new
theory that can explain the results of previous research as well as the newly discovered
falsifying evidence. In addition it should predict new, yet unobserved empirical facts.
Such a theory has a bigger empirical content, is more informative, and has more truth
value (verisimilitude) compared to the theory it replaces. Popper explained the discov-
ery of new theories as the outcome of psychological processes, which have not to be
accounted for. Their origin in the context of discovery did not matter to him; all that
counted was the test they were put to in the context of justification. Karl Popper,
Conjectures and Refutations: The Growth of Scientific Knowledge, London: Routledge & Kegan
Paul, 1972, p. 61.

[13] In the literature on the cycle of discovery 'abduction' and 'retroduction' are used
as synonyms. That is why in the rest of the article 'abduction' is preferred to 'retroduction'.

(1) data, (2) explanation, (3) logic of inquiry, and (4) validation. The critical realist approach to social scientific research should be built on the re-conceptualization of these building blocks.

3. *Building Blocks of the Critical Realist Approach to Social Science*

The specific meaning of the concepts of data, explanation, logic of inquiry and validation for the critical realist approach can be neatly illustrated by way of contrast with how they are used in the example presented in the previous section.

3.1. *Data*

The re-conceptualization of the concept of data is the corner-stone of the transition from the conception of the framework of social scientific research as a context of justification to that of a cycle of scientific discovery. It resides in the replacement of an empiricist or interpretive understanding of the concept of data by a critical realist one. This can be illustrated in relation to the previous example where the concept of data refers to the number of goats' heads being cooked in a cauldron for a side dish at Rejang marriage ceremonies. The meaning attributed to the concept of data was that of numerical or alphanumerical scores or values (one or two) on a specific variable (goat's head) attributed to a certain set or universe of units of observation (marriage ceremonies). This, essentially, is an epistemological definition of the concept of data in terms of a procedure of quantitative measurement. The scores one and two are considered to directly correspond with and reliably mirror the objective, empirically observable fact of the number of goats' heads being cooked. As such it is heavily infused with the empiricist ontological conception of social reality.

In order to comprehend the critical realist understanding of the concept of data, imagine you are standing in the downtown area of a modern city on a sunny day at 10.00 a.m. in front of a glass walled high-rise building. When you look at the building from a distance of, say, fifteen metres you might see your image on the glass wall. Now, imagine that another person stands at a distance of some ten meters from you also facing the building. If he looks from his position at the glass wall, then, although from a different angle, he can see the image of you standing in front of the building, and notice, for instance, that you are a woman of a certain height, wearing a certain style of clothes, and walking on high-heeled black shoes. Although he would obtain the same sort of data about you as you

can yourself, the image of you this other person sees is not at the same spot on the glass wall as where you see your own image. And if he, or you, were to move from your original positions, then the image on the glass wall would move too. If from different perspectives a definite image of you can be seen on the glass wall, what is the ontological status of those images? Are they 'traces' or 'marks' offered to us by systems or cases, as suggested by David Byrne?[14]

Viewed from a critical realist perspective the mirror image seen on the glass wall is a phenomenon generated by or emerging from the inter-action between, among other things, electro-magnetic radiation (light) pro-duced by the sun entering into the scene, the presence in the body of the observer on the scene of a lens in the eye-ball, the working of specific cells in the eye capable of absorbing the radiation, mental processes in his brain, the person being observed, and glass material on the outside of the build-ing with a surface incapable of absorbing all radiation and instead reflecting a part of it. This means that the image is 'empirical' precisely in the specific critical realist sense of the word. It is a manifestation or appearance in the domain of the empirical of the interaction (event) between an inquisitive mind in a human body (an embodied perceptual mechanism) with a series of other mechanisms (such as the person observed, the glass walled build-ing, the sunlight entering the scene, et cetera), within a certain environ-ment (context). The data are not objectively given facts. Rather, they are constructed by an act of active, conscious, and conceptually informed sen-sory perception as an integral part of an event actually taking place at a certain time and place. These data are 'real' in the sense of being an inte-gral part of something, a domain, that possesses an ontological depth of its own, including experiences, events, and mechanisms. This also holds for the sensory observations of the varying numbers of goats' heads toss-ing in the cauldron at different Rejang marriage ceremonies. Taken in this critical realist sense, those data are not the end point of a measurement process, but the starting point of a scientific adventure. They are the 'secret door' leading to the stairs descending into the deeper levels of reality. In order to open this secret door, though, a special Bhaskarian formula should be spoken: How might social reality among the Rejang be constituted that those data follow from it as a matter of course? In other words: What is a critical realist explanation for those data?

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[14] David Byrne, *Complexity Theory and the Social Sciences*, London: Routledge, 1998, p. 35.

3.2. *Explanation*

In the Rejang example, the author tried to explain the empirical phenomenon of the numbers of goats' heads being cooked at marriage ceremonies in terms of a causal relationship with some other so-called empirical phenomenon acting as the independent variable, such as the number of guests or conformity with the rules of Islamic marriage law. This kind of explanation falls entirely within the domain of the empirical. This also holds for the law of demand-and-supply of the deductive-nomological theory under which the causal relationship was subsumed. From an empiricist and interpretive perspective, however abstract the concepts contained in the core propositions of a deductive-nomological or any other theory might be, to provide a valid and true explanation these concepts are always required to fall squarely within the domain of the empirical. Otherwise the explanation would be considered as metaphysical and dismissed as untrue and invalid.

In contrast, according to critical realism, the data to be explained should be understood as the representation in one form or another of a set of manifestations or appearances in the domain of the empirical observed through the senses. They should be explained as a matter of course in some event or series of events taking place at a certain point in time and space, which, in turn, is considered to be generated by the working of some mechanism or set of mechanisms operating within a given context. This event and mechanism are thought to be an integral part of reality itself, and to be situated at a lower level, beyond the domain of the empirical.

This kind of explanation can be illustrated with the help of Aristotle's classification of causes. That philosopher explained the splendid imagery of a classical Greek statue in terms of four different kinds of causes: (1) the material cause (the slab of marble fetched from the side of a mountain), (2) the efficient cause (the labour spent by a sculptor on sculpting), (3) the formal cause (the model used as a guideline or example), and (4) the final cause (the purpose of the sculpture).[15] Viewed from a critical realist perspective, the imagery of the sculpture is the manifestation or appearance in the domain of the empirical of a process of interaction during a period of time at a certain place between these four causes (the event or

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[15] Bhaskar himself refers to the possibility of characterizing, or modelling, science in essentially Aristotelian terms: Roy Bhaskar, *Scientific Realism and Human Emancipation*, London: Verso, pp. 54-5; *A Realist Theory of Science*, London: Verso, 1975/1997, p. 21n.

series of events). Each of these causes, the marble, labour, model and purpose, is a different kind of real entity possessing specific causal properties. Taken together these four causes are the elements or parts of a systemically structured whole. The interaction taking place between them escapes direct sensory observation and is understood in terms of the concept of a mechanism. In addition, the entire process of creating the sculpture, as well as the specific meaning attributed to it, can only be understood properly in terms of the wider context of the social structure of Greek society of the time. The events and mechanisms, which are thought to be situated at underlying levels of reality, explain the statue's imagery.

Aristotle's causal explanation of the imagery of a classical Greek statue fits perfectly with the critical realist ontological conception of data presented in the previous sub-section, and also seems to be helpful in finding an explanation for the goat's head cooking mystery. Before coming back to that example, however, we must first address another question: How can one develop such a critical realist explanation in the first place? What kind of logic or mode of inference is required?

3.3. *The logic of inquiry*

In the Rejang example the logic of inquiry consisted of a combination of induction and deduction.[16] First, based on direct observation of the cooking practices at Rejang marriage ceremonies, some so-called empirical regularity was noticed. Next, this regularity was subsumed under a proposition stating a general regularity of universal law which, in turn, was used to deduce specific hypotheses predicting new empirical observations. The entire research process seems self-explanatory and straightforward.

The example of the classical Greek statue, in contrast, reveals that social scientists who try to develop an explanation following the principles of the critical realist approach to social research face a serious problem from the outset. The splendid imagery of the statue observed through the senses gives no clues or hints about how to explain and understand it. The gap between the appearances of the statue observable through the senses and the underlying mechanism, from which it is thought to have emerged, seems unbridgeable. What mode of inference or logic, if any, is capable of linking the sensory perceptions of the statue to this underlying mechanism?

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[16] Adriaan De Groot, *Methodology: Foundations of Inference and Research in the Behavioural Sciences*, The Hague: Mouton, 1969, p. 64.

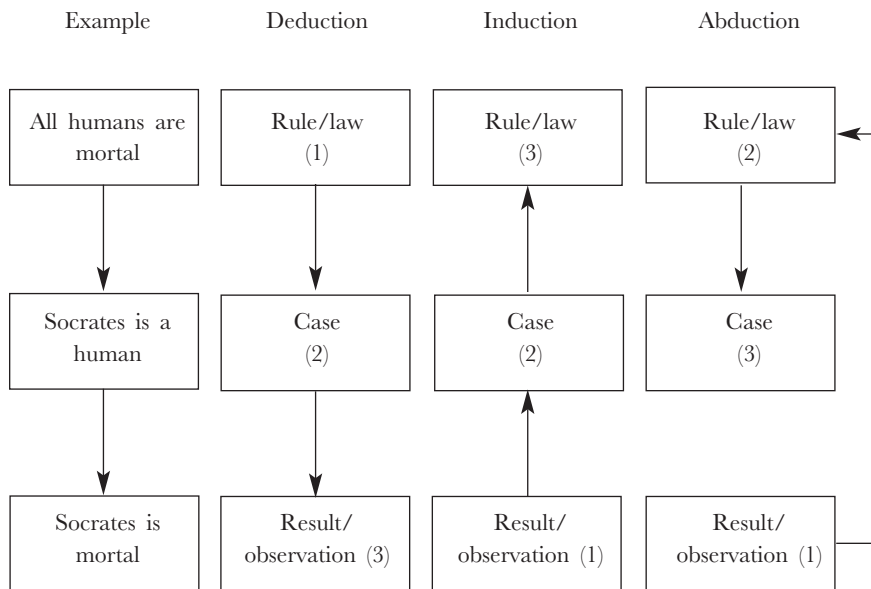| Example	Deduction	Induction	Abduction

Figure 2. The difference between deduction, induction and abduction

Note. Text boxes with solid lines contain the premises or hypotheses that are presupposed as given or true; text boxes with dotted lines contain the hypotheses inferred.

The mental acrobatics required for this seem to imply a creative leap, to say the least. That means quite clearly that induction and deduction are of no use. In the literature on the various modes of inference, the only kind of reasoning that is considered to involve a creative leap is called 'abduction' (see Figure 2).[17]

Like most writers on the subject, Hans-Rudi Fischer also presents deduction and induction and abduction as three essentially different modes of inference. It is commonly understood that deduction is the mode of inference which proceeds from the general (rule or law) to the particular (result or observation). This implies that the content of the conclusion is always the same or smaller than that of the premises. In addition, a valid deduction is truth-conserving. If the rule or law is really true, then the conclusion

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[17] Hans-Rudi Fischer, 'Abductive reasoning as a way of world making', *Foundations of Science* vol. 6, no. 4, 2001, pp. 361-83.

must by necessity be true too. Where that rule or law comes from in the first place remains unspecified. Induction is commonly taken as proceeding in the opposite direction, from the particular (result or observation) to the general (rule or law). In contrast to deduction, the content of the conclusion reached by induction is bigger than that of the premises. That means that induction is content-increasing, but, in contrast to deduction, it is not truth-conserving. The validity of its conclusion cannot be proved with absolute certainty. In order for an inductive inference to be valid, it is logically necessary that the general rule or law is known beforehand as a hypothesis.[18] Induction can only be used to validate that previously hypothesized general rule or law. This comparison of deduction and induction shows that in the case of deduction and induction the origin of the hypothesis remains a complete mystery. Deduction and induction are not capable of explaining this. It is precisely at this point that abduction steps in.

Abduction has been studied by Charles Peirce in great detail. He has specified the importance and role of abduction in the context of the process of scientific research. According to him the beginning of all scientific research consists of an unexplained 'amazing' fact (result or observation). This amazing fact is then explained as the effect of a hypothetical cause (rule or law). This hypothesis is arrived at through abduction (which Peirce also calls retroduction). But the introduction of the missing hypothesis through abduction entails a serious problem. Suggesting a certain explanatory hypothesis does not prove anything. What is more, in traditional logic abduction is considered a fallacy (the *fallacia consequentis*).[19] The reason for this is that abduction is an inference from the consequent to the antecedent, which is from effects to causes. Such a procedure makes fact and fiction indistinguishable.

It seems as if by introducing abduction to the critical realist approach to social scientific research things are going from bad to worse. On the one hand abduction is viewed as exactly the kind of logic required to arrive at the hypothesis presupposed by deduction and induction. On the other hand the point should be taken that abduction by itself cannot deliver the answer to the question: How do we know that the explanation based on that hypothesis is valid? Far from being a dead-end, however, this is the exact point at which a shift in our perception of the social scientific research process is required. As long as the research process is viewed merely as a

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[18] Ibid., p. 367.

[19] Ibid., p. 369.

context of justification of specific knowledge claims, discussion about the proper logic of inquiry will focus on the question of which of the various modes of inference can, by itself, produce valid scientific explanations. The foregoing comparison of induction, deduction and abduction reveals that, taken alone, none of them can do so because each ends in a deadlock. The only way out of this triple dilemma is to put these three modes of inference in relation to each other. That is possible only when they are viewed as an integral part of a larger whole: the cycle of scientific discovery.

The cycle of scientific discovery can be thought of as an iterative process consisting of a series of three stages. According to Peirce the cycle starts with some unexplained amazing fact, that is, a perceived gap between some sensory perception and the existing stock of knowledge. The Rejang cooking mystery answers to this description. To close this gap a hypothesis is conjectured specifying a particular rule or law, which, if it were true, would explain the amazing fact as a matter of course. In the second stage, in order to determine whether the explanation based on the hypothesis conjectured by abduction is valid or not, from this hypothesized rule or law should be deduced what must be the case by necessity, assuming that the hypothesized cause is really true. In the third stage, based on detailed and carefully gathered information about what actually is the case, by way of induction, a judgment should be made as to whether the amazing fact is properly understood and explained in terms of the previously hypothesized rule or law or not. If not, the perceived gap is not closed and a new hypothesis should be conjectured based on abduction. According to Peirce, abduction, deduction, and induction are integral parts of scientific explanations and are intimately related to each other in a very special way. Abduction is 'the process of forming an explanatory hypothesis. It is the only logical operation, which introduces any new idea; for induction does nothing but determine a value, and deduction merely evolves the necessary consequences of a pure hypothesis. Deduction proves that something must be; induction shows that something actually is operative; abduction merely suggests that something may be'.[20]

But, this is not all that should be said about it. Critical realism, for its part, adds something special to the understanding of a scientific explanation as enunciated above. In the foregoing discussion abduction is depicted as the mode of inference bringing forward the hypothesis required for

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[20] Quoted in ibid., p. 369.

deduction and presupposed by induction. This, however, is just its formal aspect. Whether abduction will work for the development of scientific knowledge or not boils down to the kind of hypothesis being brought forward with its help. Precisely at this point critical realism suggests an interesting idea. This only becomes clear if the discussion about the role of abduction in scientific explanation is put in relation to the ontological notion of a hierarchically stratified reality assumed by the critical realist approach to social science. Abduction is then no longer analyzed in an attempt to specify the logical relationship between the various elements of the classical syllogism, in which case abduction represents a logically invalid inference, but is instead used to explicate the line of argument involved in the depth-ontology of critical realism. In that context abduction helps to specify the relationships of causal necessity between the different ontological levels (see Figure 3).
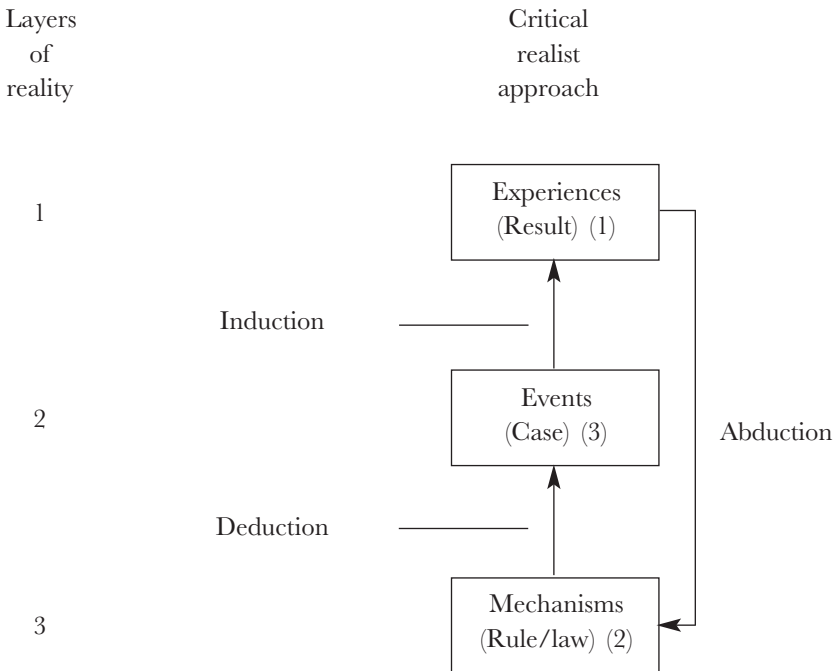

Figure 3. The place of abduction in relation to critical realist ontology

Applied to the Rejang goat's head cooking mystery, this description of the cycle of scientific discovery means that an explanation should start from a deliberate, creative attempt to suggest, in the form of a fallible hypothesis, an idea about the underlying mechanism that might act as a kind of general rule. But, specifying such a hypothesis—which if really true, in the given particular case would explain the observable phenomena about the Rejang cooking practices as a matter of course of that underlying mechanism—is just the first step in a research process following critical realist principles. As Peirce states, the abduction merely suggests that something might be the case. The hypothesis by itself does not deliver any proof whether the hypothesized underlying mechanism is actually working in this particular case or not. In order to find out, based on the inferred hypothesis, a number of deductions should be made. These deductions refer to the patterns and regularities that must typically be the case if the hypothesized underlying mechanism is operating as the general rule. The deductions are inferred for the explicit purpose of specifying the information required to corroborate the hypothesis about the underlying mechanism. The special role of induction in this context, then, is to determine whether the hypothesized underlying mechanism and the deduced regularities and patterns really obtain and to what extent.

It is crucial in this context to note that the deductions and inductions say nothing about reality on the scene of the Rejang marraige ceremonies observed through sensory perception in the sense of direct representation. Corroboration simple means that the proposed hypothetical explanation is functioning. The inductions and deductions are directed by the hypothesized underlying mechanism proposed as an explanation. The hypothesis, as it were, sets a standard. If the inductions and deductions derived from the hypothesized underlying mechanism fail to be corroborated, then, apparently, the explanation does not work and the hypothesis should be discarded. From this failure it can be concluded that reality is different from the one conceptually construed. A new explanation is needed, which should be arrived at by abduction in the next cycle of discovery.

The foregoing shows that, in Peirce's conception of a scientific explanation, the role that deduction and induction have to play in social scientific research is completely different not only from that envisioned in the empiricist and interpretive approaches to social research but also from that presented in the literature on critical realism. The hypothesis is not being deduced from a theory but precedes the deduction. In line with this, induction is

viewed as an inference from the hypothesis to the facts, not from the facts to the hypothesis.[21] The amazing fact of the Rejang goat's head cooking mystery is considered to be explained if it can be demonstrated that it follows from the hypothesized underlying mechanism just as a matter of the typical course this takes.

Be that as it may, what has been presented so far is only a description of the general procedure of developing and corroborating a scientific explanation following the critical realist approach to social science. This is still insufficient because it does not explicate how to decide why a certain explanation is better than another. This question is about validation.

3.4. *Validation*

Viewed from a critical realist perspective, the concept of validation typically concerns the kind of answer that is required by a 'Why?' question in order to be considered valid. Why, for instance, do we easily accept the relationship between, say, the totally devastated towns and villages in the coastal areas of the province of Aceh in Indonesia and the tsunami that struck the area on the 26th of December 2004 but not the relationship between that catastrophe and the singing of birds?

Accepting the validity of the first hypothesis instead of that of the second, or any other, is based on the possibility of demonstrating the identity between the fact to be explained (the devastated towns and villages in the coastal areas of the province of Aceh) and the proposed explanation (the event of the tsunami on the 26th of December 2004 resulting from an earthquake generated by the interaction between two tectonic plates, the seafloor of the Indian ocean and the south-east Asian continent). This identity can be demonstrated based on two specific criteria. The first is that of overlap between the case and the universe of discourse it belongs to. Formulated in the form of a question this becomes: Is this catastrophe in the province of Aceh really a case that belongs to the total number of catastrophes that is generated by a tsunami? That means, does the catastrophe in the province of Aceh, as a sample or subset, fall squarely within the extension of the universe of discourse (or population) mentioned in the

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[21] Gerhard Minnemaier, 'Peirce-suit of truth: why inference to the best explanation and abduction ought not to be confused', *Erkenntnis*, vol. 60, no. 1, 2004, pp. 75-105.

case, which is the total number of catastrophes that the concept of tsunami is truly applicable to? The second criterion is that of similarity of meaning between the hypothesized cause and the observed case. Is the specific meaning of 'being hit by a tsunami' really part of the total sum of meanings that the devastated towns and villages in the coastal area of the province of Aceh give us to understand? The devastated towns and villages possess a large number of characteristics making up the sum of meanings, for instance their size, geographical location, the number of inhabitants, economic structure, the number of public services, cultural history, et cetera. These characteristics taken together constitute the intension of the devastated towns and villages, which is all their features potentially contributing to an understanding of them. Being hit by a tsunami is considered a criterion that meets the requirements of validity if that hypothesized characteristic really is a part (subset) of the intension of the devastated towns and villages in the province of Aceh (see Figure 4).
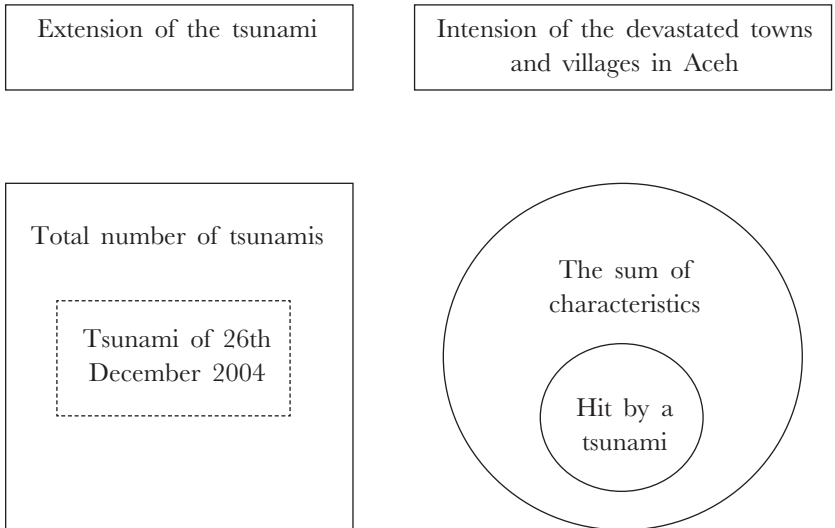

Figure 4. Criteria of dual demonstrability of a valid explanation

It should explicitly be stated here that the validity of the scientific explanation or understanding being conjectured is not determined in terms of either true or untrue, but in terms of right or wrong and to what extent. The explanation and understanding are always partial and based on the selection by substantive abstraction of specific aspects or elements from reality.[22] As such it does not mirror or correspond with reality but rather maps and represents it based on similarities. In this sense an explanation or understanding can only be more or less wrong, more or less detailed, more or less exact, or of bigger or smaller scale.

In addition, the foregoing implies that alternative explanations and ways of understanding of a certain phenomenon are possible and that the scientist has to adjudicate between them. Perhaps it is true that in regard to a given set of data, an infinite number of different explanations and interpretations can, in principle, be advanced. But that is not the way scientists do research from a critical realist approach. In practice it is very difficult to come up with more than two or three different plausible explanations. The reason is that trying to find an explanation in terms of a generative mechanism is to search for something beyond the domain of the empirical. Taking on more empirical data complicates rather than simplifies this task. At the very start the researcher has little idea what to expect. Suggesting dozens of possible alternative explanations raises great suspicion. In order to get just one plausible explanation requires that each and every step is carefully reflected upon and systemically thought through in search of clues and hints of how reality actually might be constituted. Alternative explanations and interpretations are not available in a ready-made or ready-to-use form. It takes a lot of effort and time to get the ideas right; they can only be developed piece by piece and cannot be put to test as a whole.

This re-conceptualization throws up a number of additional interesting questions. For instance, what kind of theory or model of the underlying mechanism should be developed? What are appropriate research questions for this kind of research? From where do researchers get their ideas about the kind of underlying mechanism involved? Is it simply intuition or are they based on re-interpretations of existing social scientific concepts and

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[22] Andrew Sayer, 'Abstraction: a realist interpretation', in Margaret Archer et al., eds, *Critical Realism: Essential Readings*, London: Routledge, 1998, pp. 120-143; Andrew Sayer, *Method in Social Science*, London: Hutchinson, 1984/1992, pp. 85-92, 138-43.

theories? Should they be related to existing notions and theories within the disciplinary field concerned or can they be taken from any branch of science? Further questions can be asked about the research methods and techniques. What does the re-conceptualization of the key concepts imply for the way in which the various methods and techniques of sampling, data generation and data analysis are developed and used? What kinds of research design are to be used? How are we to choose among the existing diversity of approaches to social scientific research, research design, and the broad range of existing methods and techniques? In the literature on critical realism these questions have already been addressed, though space precludes further discussion here.[23] It is now time to return to the cooking customs of the Rejang people.

4. *How Can the Goats' Heads Story Be Taken Further?*

How can the Rejang goats' heads cooking custom properly be explained and understood in terms of a critical realist approach to social scientific research? Clearly we should not try to force the sensory observations (experiences) of different numbers of goats' heads tossing in cauldrons into the stifling mould of a direct inductive or deductive relationship between data and theory. Instead, the following question should be put to them: what is it about the social life of the Rejang people in Bengkulu that makes the differences in numbers of goats' heads tossing in a cauldron at marriage ceremonies just a matter of course? That is, what set of interacting mechanisms, and operating in what context, manifests itself in these data?

In short, in order to explain and understand the negative statistical relationship between the number of guests and visitors attending marriage ceremonies and the number of goats' heads being cooked, together with a spurious relationship between the number of goats' heads being cooked at Rejang marriage ceremonies and the rules of Islamic marriage law, one should start with an abduction, that is a leap from the empirical experience of seeing the goats' heads tossing in a cauldron to a tentative idea of 'what might be the general rule in this case?'. The key is the belief of

[23] Andrew Sayer, *Methods in Social Science*, London: Hutchinson, 1984/1992, pp. 241-51; Berth Danermark, et al., *Explaining Society: Critical Realism in the Social Sciences*, London: Routledge, 2002, pp. 150-176; David Byrne, *Interpreting Quantitative Data*, London: Sage 2000; Ray Pawson and Nick Tilley, *Realistic Evaluation*, London: Sage, 1997, pp. 152-82.

the Rejang that a marriage is an exchange between two groups of people, which needs the blessing of their ancestors 'in heaven'. In order to seek their blessing, the ancestors should be informed by sending them a proper message in the form of a soul. For this purpose at each marriage ceremony among the Rejang a goat is ritually sacrificed. However, for a marriage to be proper, and the fertility and prosperity of all parties involved to be sustained, certain rules of the customary law (*adat*) of the Rejang people must be obeyed. The spouse and bride should belong to two different marriage classes. A Rejang marriage class is a four-generation descent group comprising all patrilineal descendants from a person's great-great-grandfather (*poyang*). Marrying or having sexual relations with someone within one's own marriage class is considered incest. Such a deed is believed to provoke the anger of the ancestors. Their revenge is to cause loss of fertility and prosperity, which manifests itself in widespread death and disease, crop failure, and social conflicts among the members of the village community. Incest is considered the worst deed a person can do, and is believed to trigger the greatest disaster that can befall a village community.[24]

Since the end of the nineteenth century conditions in the homeland of the Rejang people have changed dramatically. The homeland has opened up and modernization is flooding in. One of these external influences is Islam. As a consequence, under present circumstances the occurrence of incestuous sexual relations according to the rules of customary law of the Rejang people cannot be socially controlled as in former times.[25] In addition, the moral problem involved has become much more complex. What clearly is an incestuous sexual relationship according to Rejang customary law is not being considered as such according Islamic marriage law. According to Islamic marriage law only marriages and sexual relations between patrilineal descendants from the same grandfather are considered incestuous. That means, in the case of a marriage between two members of one and the same traditional marriage class the Rejang face a real dilemma: what might be a legitimate sexual relationship according to Islamic marriage law is considered outrageous according to their own customary law.

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[24] J. Wuisman, *Sociale Verandering in Benkulu*, Dordrecht: Foris, 1985, pp. 81-2.

[25] In former times the man and woman involved in a incestuous relationship were killed. After the Europeans conquered the area death sentence was forbidden. Nevertheless, this kind of murder occurred until the 1940s.

As a way out of this dilemma, and in order to let their marriages be legitimate in terms of their own customary law as well as Islamic marriage law, two goats are sacrificed! One goat is indeed regarded as a fine imposed on the culprits because of the breach of the rules of customary law. However, this animal plays a very special role in the whole process. In order to transform an incestuous relationship according to Rejang customary law into a legitimate one, the couple involved should first be separated from their common marriage class. This is achieved by transferring one member of the incestuous couple, usually the male partner, to another marriage class within the village community. This transition, however, needs the blessing of the ancestors. In order to obtain that blessing a goat must be ritually sacrificed in order to inform the ancestors about this transition. After that the second goat is ritually sacrificed in order to inform the ancestors that a marriage is being performed between two people belonging to two different marriage classes in conformity with the rules of Rejang customary law, and as beseeching them to bestow their blessing on the newly wed couple and the families and marriage classes involved. The second goat signifies the transfer of the groom, for better or worse, from the marriage class to which he was previously transferred, to that of his bride. Since the two goats are sacrificed during the same ceremony, one after the other, the two goats' heads end up tossing in the cauldron together. If a marriage is performed in conformity with the rules of Rejang customary law, that is, between a bride and a groom who from the very beginning belong to two different marriage classes, no separation ritual has to be performed, and only one goat is needed as a sacrifice. In such a case only one goat's head ends up tossing in the cauldron.

The explanation of the varying number of goats' heads at Rejang marriage ceremonies presented above includes all elements of the type of explanation required by the critical realist approach to social scientific research. It starts from an amazing set of data, representing the manifestations or appearances observed through the senses within the domain of the empirical. Next, through abduction these data are related to a complex underlying social mechanism involving the interaction between a number of specific elements or parts possessing causal properties. In order to understand it, a model must be created which adequately maps the various elements, relations, interactions, purposes and contexts. In order to differentiate between the various parts involved the classification of these parts in terms of Aristotle's four kinds of cause is a practical heuristic. The first part of this mechanism is the couple, the man and woman to be married through

a series of activities, rituals and ceremonies. They are the material cause. The second element consists of one or two groups of people representing the exogamous marriage classes involved, and who are carrying out the various activities, rituals and ceremonies required for the occasion. They are the efficient cause. The third element includes the various rules and regulations stipulated by the customary law of the Rejang people and Islamic marriage law, including the number of goats to be ritually sacrificed. They are used as a guideline for the confirmation and celebration of the wedding, and are the formal cause. Finally, the fourth element is the notion of fertility and prosperity as a gift of the ancestors to all parties involved that has to be invoked from them through a ritual sacrifice. This notion informs the entire ceremony with its specific meaning and is the final cause involved. It should be added that this complex mechanism comes into operation within the context of the particular context of the Rejang culture and society.

The hypothesis put forward here is that, in critical realist terminology, the different numbers of goats' heads being cooked are the manifestation or appearance in the domain of the empirical of the working of the complex underlying mechanism previously described. When this mechanism comes into operation and how exactly it will work in any particular case, depends to a great extent on the specific circumstances. In the example being discussed, two typical modes of operation are distinguished: one where the rules of partner selection are properly observed, and one where they are violated and a deed of incest has been committed. As indicated, the occurrence of the latter case is related to certain disturbances in the environment. In each of these two typical cases the event of the marriage ceremony will be viewed and experienced quite differently by the people involved. In the case of a proper relation between the couple the marriage ceremony carries the meaning of a reaffirmation of the cultural traditions and is experienced as a celebration of the existing social structure; in the second case the improper relation between the couple casts a shadow over the occasion that tends to cover all other elements, making it a different kind of event emotionally, physically, socially and mentally. This difference in kind of event is expressed in the domain of the empirical through the verbal and non-verbal behaviour of the various categories of people involved.

What about the so-called empirical regularities discussed in the first part of the Rejang example? Are there any? One example is the following. For Rejang marriages being confirmed according to the rules of customary law the following holds true: if the couple originates from one and the same

marriage class, then, depending on the prevailing context, at the marriage ceremony two goats' heads will be tossing in the cauldron, and conversely, if the couple involved originates from two different marriage classes, then only one goat's head will be tossing in the cauldron. Is this a general regularity or universal law in the empiricist understanding of the term? No. It is only a statistical pattern that can be found in the data, a descriptive representation of the distribution of numerical or alphanumerical values or attributes in this set of data. As such it does not explain anything and cannot be explained by anything similar. On the contrary, the statistical pattern, perceived as a set of appearances or manifestations in the domain of the empirical, begs for an explanation in terms of the way the underlying mechanism is working in a particular case or set of cases within a particular spatial and historical context. The only way to uncover such an explanation is by following the path of the cycle of scientific discovery. That is what the critical realist approach to social scientific research seems to be all about.

5. *Conclusion*

The discussion began with a reference to the perceived gap between the philosophical and methodological ideas of critical realism and the practical aspects of doing research. The thesis advanced is that critical realism can be put to work more fruitfully for the social sciences if the role of the various modes of inference is not analysed within the limited confines of the context of justification of specific knowledge claims, but viewed within the much broader and more encompassing framework of the cycle of scientific discovery.

In order to demonstrate this point, a small piece of field research was carefully analyzed to determine where the empiricist and interpretive approaches to social research exactly get stuck, and why they sooner or later end up at that point. The diagnosis was that these approaches are caught in a vicious circle, one that is fuelled by the negative reciprocal relationship between deduction and induction and which emerges when these two modes of inference are taken out of the broader context they belong to. In order to break out of this stifling mould the process of social research is reconceptualized as a process of discovery in which two distinct elements as integral parts are incorporated. First, the established practices of justification of knowledge claims based on deduction and induction are to be fully incorporated in the cycle of discovery. The second element

is the key role of the researcher (observer). A cycle of discovery can only be triggered by the interaction between a theoretically informed, reflective and inquisitive mind and the manifestations that appear in the domain of the empirical. What in this context is special about critical realism is not only that its ontology contains a clear hypothesis about what represents the field of discovery open to the social sciences (that is, the outer-empirical within the domain of the real) but also points to what to look for in the first place: underlying mechanisms that operate in a particular context and that might generate events whose appearances manifest themselves in the domain of the empirical. Where critical realism still seems to fall short, however, is in following up the logical implications of its own ontology to their endpoint. The ideas presented in this article aim to remedy these weaknesses in critical realism and to be useful for future efforts to close the existing gap between its philosophy and methodology and the practice of social scientific research.