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This paper began with an invitation from Japan a month after the disaster at Fukushima I Nuclear Power Plant began on March 11, 2011. The paper was to be presented six months later (October 30) — at a conference where I was already scheduled to present a paper on the use of imaginary cases in ethics (Davis, 2012). The disaster was still very much the province of journalism. Its outlines certainly lacked the stability of history. Of course, even history, though it generally seems stable, is not entirely so, being subject to dispute here and there and to radical revision every now and then. At first, Fukushima’s facts changed almost daily — if by “facts” we mean those descriptive propositions about which there is general agreement. After a while, the changes were less frequent and more a matter of addition than correction. Today, a year after I began work on the paper, the outline of the disaster seems settled. Dispute now concerns only details, such as how much land, if any, will have to be abandoned for some years, how many pre-mature deaths are to be expected because of radiation released during the disaster, and so on. At some point, I had to stop worrying about the facts and report my reflections. I stopped worrying about the facts on October 15, 2011. Since then, I have changed “a fact” only when a reader or auditor pointed out that it was no longer fact.

I am an oddity in science and technology studies (STS) because I focus not on science and technology but on scientists and technologists. Indeed, I do not write about “scientists” in general or “technologists” in general but about specific professions, for example, chemists or engineers. While most STS scholars seem
to be interested in what scientists or technologists have in common, I have focused on what distinguishes one discipline from another, for example, what distinguishes chemists from engineers (Davis 2002). I have found that there is a third way to study professionals, especially the profession of engineering. I am, in short, not a philosopher, historian, or sociologist of technology (though scholars in those fields sometimes find my work useful). I started the invitation from Japan was a quarter-century of thinking (and writing) about engineering. (For those unfamiliar with my work on engineering, the place to start is Davis 1998.)

Though certainly a nuclear disaster, Fukushima is not like Chernobyl. The newspapers, websites, and other sources available (at least in English) seldom identified anyone as an engineer. The stories focused on “workers”, “managers”, and machinery. I had to use what I knew about nuclear power plants in the United States to interpret the facts thus given. I had similar problems, though less severe, when interpreting the other disasters to which I chose to compare Fukushima. Interpretations are, of course, open to objection but, without interpretation, facts merely pile up, becoming in time an unmanageable heap. There is no understanding without interpretation. But interpretation relying on changing facts is necessarily the sort of time-stamped enterprise philosophers are inclined to avoid—and I would have avoided the time-stamped invitation from Japan. There isn’t much that a philosopher can do about a disaster such as that at Fukushima—except help those seeking to understand it and thereby help prevent similar disasters. I felt owed the Japanese that much.

This paper’s title promises “reflections” on Fukushima, not systematic or definitive understanding. Reflections are what one gets when, focusing thought on a problem, connections one happens to see, connections that seem to jump out of the dark. Reflection is a source of hypothesis rather than proof, and is only one of many methods we humans use to seek to discover a conclusion that, though far from provable given the facts we have, invites investigation. There is no methodology for reflection, no test of success beyond useful surprise.

Why Compare These Four Disasters?

The nuclear disaster that Japan suffered at Fukushima has been compared with other major nuclear disasters, especially the accident at Three Mile Island (1979) and Chernobyl (1986). It is more like Chernobyl in immediate destructiveness, the only other 7 on the International Nuclear Event Scale (the upper limit of which is 7). It is more like Three Mile Island in probable long-term effects (though Fukushima’s long-term effects are likely to be substantially worse than Three Mile Island’s). To date, Chernobyl seems to have directly killed thirty-one reactor site personnel and workers, to have caused between 200,000 and 1,000,000 premature deaths worldwide, to have forced the permanent abandonment of a city of about 50,000 (Pripyat), and to have ruined perhaps a 100,000 square km of farmland. Over 300,000 people lost their homes to contamination. (All information about Chernobyl here and below is drawn from Wiki, “Chernobyl”, a source valuable both because it is easily accessed and regularly updated.)

In contrast, the radiation released from the Fukushima plant, though significant, will, it seems, leave little long-term contamination, except at the plant itself and in a plume perhaps fifty km beyond. At least six workers have exceeded lifetime legal limits for radiation and more than three hundred have received significant radiation doses. Estimates of future cancer deaths due to accumulated radiation exposures in the population living near Fukushima have ranged from none to a non-peer-reviewed “guesstimate” of a thousand. No one died in the explosions at the plant or from subsequent radiation exposure (though sufficient doses of radiation for evacuation of hospitals in the exclusion zone may have caused as many as forty-five more deaths). The earthquake or tsunami, rather than the nuclear accident, seems to be responsible for the few employees severely injured or killed at the plant. (Wiki, “Fukushima Daiichi”)

The discussion of Fukushima below relies not only on this source but also on Wiki, “Fukushima I”. Though I shall hereafter refer to “Fukushima”, it is in fact Fukushima I (Fukushima Dai-ichi) that I shall be referring to. There is also a Fukushima Dai-ii (Fukushima Dai-ii). For details, see Wiki, “Fukushima II.”

Though certainly a nuclear disaster, Fukushima is not just another nuclear disaster. In ways important to engineers, it is much more like Kavanagh’s dilemma of New Orleans than like any other nuclear disaster. It is (primarily) a consequence of a natural—or, at least, much larger—disaster, the enormous earthquake and tsunami that wrought such much destruction, not just of the system could not pump water. So, the secondary loop was no longer working. Without the secondary loop removing heat, pressure in the primary loop began to increase, automatically triggering a relief valve on the secondary loop’s emergency feed-water pumps. This also shut down. No longer receiving water, the steam-driven generators stopped and the reactor automatically carried out an emergency shutdown. Within eight seconds, control rods were inserted into the core to halt the nuclear chain reaction. The reactor nonetheless continued to generate heat (a byproduct of the nuclear reaction) and the heat caused the reactor’s primary water loop to boil, vaporizing water to steam. This steam was then used to drive the turbine, generating electricity and producing hydrogen gas that probably caused a small explosion. Light was lost from the control room. By then, the radiation in the primary coolant water was thousands of times higher than the dose recorded inside the control room. Reactors 1 and 2 were stopped at 4:39 am.

At 6 am (two hours after the incident began), there was a change of shift in the control room. A new arrival noticed that temperature gauges in the turbine steam lines and holding tanks were too high and used a backup valve to shut off the coolant venting through the relief valve. But, by then, about 120,000 liters of coolant had already leaked from the primary loop. The operators then shut down the pumps, believing that nuclear circulation was the cause of high water movement, but steam in the system (itself the product of rising temperature) prevented coolant flow through the core. At 6:30, coolant circulation was tried again, but the vacuum in the reactor core continued to increase and the nuclear fuel rod cladding. That reaction burned off the cladding and damaged the fuel pellets. The pellets then released more radioactivity into the reactor coolant, producing more hydrogen gas that fed steam explosion in the containment building in the afternoon.

Three Mile Island

Three Mile Island was a “normal accident”, that is, it began with ordinary failures of equipment and practice within a plant itself operating normally. Perrow 1984 also describes Three Mile Island as a “normal accident”. While I agree that it was a “normal accident” in its sense, my use of that term is somewhat different. I mean simply that the accident was a product of what engineers normally do rather than a product of incompetence, negligence, corruption, or other unusual conduct (such as experimentation).

During the night of March 27-28, 1979, workers were engaged in routine cleaning of a blockage in one of Reactor 2’s condensate polishers (filters for the secondary cooling loop). At 4 am, the pumps feeding the polishers stopped. We still do not know the cause of the stoppage. When a bypass was failed to open, coolant overflowed into the secondary cooling loop. This also shut down. No longer receiving water, the steam-driven generators stopped and the reactor automatically carried out an emergency shutdown. Within eight seconds, control rods were inserted into the core to halt the nuclear chain reaction. The reactor nonetheless continued to generate heat (a byproduct of the nuclear reaction) and the heat caused the reactor’s primary water loop to boil, vaporizing water to steam. This steam was then used to drive the turbine, generating electricity and producing hydrogen gas that probably caused a small explosion. Light was lost from the control room. By then, the radiation in the primary coolant water was thousands of times higher than the dose recorded inside the control room. Reactors 1 and 2 were stopped at 4:39 am.

After almost eighty minutes of slow temperature rise, the primary loop’s four main pumps began to suffer damage as a mixture of steam and water passed through them. The operators then shut down the pumps, believing that normal circulation was the cause of high water movement, but steam in the system (itself the product of rising temperature) prevented coolant flow through the core. At 6:30, coolant circulation was tried again, but the vacuum in the reactor core continued to increase and the nuclear fuel rod cladding. That reaction burned off the cladding and damaged the fuel pellets. The pellets then released more radioactivity into the reactor coolant, producing more hydrogen gas that fed steam explosion in the containment building in the afternoon.

The Nuclear Regulatory Commission (NRC) made an extensive investigation of the disaster, a typical engineering response. Its report ended with recommendations for changes in controls, quality assurance, maintenance, operator training, management,
and communication of important safety information. There was no finding of negligence or more serious wrongdoing having caused the disaster, no suggestion that major redesign of nuclear plants was needed, and no proposal to rethink the place of nuclear energy in the generation of electricity. (Rogovin 1980, pp. 89-93, focused mainly on changes in emphasis and procedures at the NRC; Kemeny 1979, pp. 61-73, focused on “attitudes and practices”). These reports do, however, contain much criticism of other aspects of how Three Mile Island operated.

Chernobyl

Chernobyl was not a normal accident. Its cause was an engineering experiment which, though successful, lacked proper approval. That is not to say that the experiment was unjustified, fundamentally improper, or indeed abnormal.

Even when not actively generating power, nuclear reactors require cooling to remove heat produced by the natural decay of nuclear fuel. Chernobyl’s pressurized water reactors (different in design from Three Mile Island’s used water flowing at high pressure to remove waste heat (about 28,000 liters of water an hour). After an emergency shutdown, the core could still generate a significant amount of residual heat. If not removed, the heat could cause core damage (as it did at Three Mile Island). If the power grid failed, power to run the plant’s cooling system might be unavailable from outside for far too long.

Chernobyl’s reactors had three backup diesel generators. Each generator required fifteen seconds to start up but took over a minute to attain the speed required to run one of the main coolant pumps. Chernobyl’s engineers judged this one-minute power gap unacceptable. Too much can happen in a nuclear reactor in a minute when the cooling system is not working. Analysis indicated that one way to bridge the one-minute gap was to use the mechanical energy of the steam turbine and residual steam pressure to generate electricity to run the main coolant pumps while the generators were being started up. At 1:23 am on April 26, 1986, the experiment began. However, because of the natural damping effect of the core’s neutron absorber, reactor power continued to decrease, even without further operator action. As the power dropped to approximately 500 MW during the experiment, one of the engineers conducting the experiment mistakenly inserted the control rods too far, nearly shutting down the reactor. Control-room personnel soon decided to restore the power and withdrew additional control rods from the reactor core.

Then, about the time the experiment ended, there was an emergency shutdown of the reactor. The shutdown started when someone pressed the button of the reactor’s emergency protection system. (We do not know whether the button was meant to be pressed as an emergency measure, or a mistake, or simply as a routine method of shutting down the reactor upon completion of the experiment.) Because of a flaw in the design of the graphite-tip control rods, the reactor control system inserted the control rods into the reactor core to keep the temperature down. If conditions had been as planned, the experiment would almost certainly have been carried out safely. The Chernobyl disaster resulted from attempts to breach the reactor power control and, therefore, to force the reactor to its power limit. Once the experiment had started (something inconsistent with approved procedure). The approved procedure called for Reactor 4’s power output to be gradually reduced to 700–1000 MW. The minimum level established in the procedure (700 MW) was achieved about an hour before the experiment began. However, because of the natural damping effect of the core’s neutron absorber, reactor power continued to decrease, even without further operator action. As the power dropped to approximately 500 MW during the experiment, one of the engineers conducting the experiment mistakenly inserted the control rods too far, nearly shutting down the reactor. Control-room personnel soon decided to restore the power and withdrew additional control rods from the reactor core.

Fukushima

The disaster at Fukushima fits neither of these patterns. The accident was not normal or the result of an engineering experiment. It was also not the result of operator negligence, incompetence, or misconduct. The accident was not the result of any Japan had experienced in 1400-years of recorded history (http://en.wikipedia.org/wiki/List_of_earthqua kes_in_Japan, accessed April 25, 2011).The quake was followed by an enormous tsunami. That double disaster would have happened even if the Fukushima nuclear power plant, one of the twenty-five largest in the world, had never existed. The nuclear disaster is a byproduct of that large natural disaster.

At the time of the quake, 2:46 pm, Reactor 4 had been de-fueled while 5 and 6 were in cold shutdown for planned maintenance. The remaining three reactors shut down automatically when the reactors shut down. The plant’s own generation of electricity ceased, eliminating one source of electricity used to run cooling and control systems. One of the consequences of the national electrical grid also died. That loss of power started up thirteen on-site emergency diesel generators. These would ordinarily have provided enough power to operate the reactors’ control and cooling systems until the national connection to the national grid could be restored. Had the earthquake been the only disaster to hit the Fukushima plant on March 11, there would have been little to discuss here. The tsunami changed that.

The plant was protected by a seawall designed to withstand any tsunami up to 5.7 meters, but the great wave that struck forty-one minutes after the quake was fifteen-meters high. It flooded the entire plant, including generators and electrical switchgear in reactor basements. It also broke the remaining connection with the national electrical grid. All conventional power for cooling was lost. Only one backup remained: emergency batteries, able to run some of the monitoring and control systems for up to eight hours. Replacement batteries and mobile generators were soon dispatched to Fukushima, but collapsed bridges, debris-strewn roads, and similar obstacles delayed them. The first replacements did not arrive until 9:00 pm (six hours after the first call went in).

The arrival of the replacement batteries and mobile generators did not end the crisis, however. They had to be installed. The normal connection points were in flood-laden natural sites. There was also difficulty finding suitable cables. Work to connect batteries and generators was still continuing twenty-four hours after the quake when there was an explosion in Reactor 1’s building. The side walls of the building roof collapsed, and debris covered much of the floor and machinery.

The roof of the building was designed to provide ordinary weather protection, not to withstand an explosion or to act as containment for the reactor. In the Fukushima reactors, the primary containment surrounded the reactor’s pressure vessel. The top floor had no reactor. Only water filled pools for storing new fuel ready to be craned into the reactor and used fuel ready for disposal. This first explosion was probably caused when
hydrogen collected under the roof. Exposed fuel rods became very hot and reacted with steam, oxidizing the cladding and releasing hydrogen. The hydrogen would have leaked upward. Safety devices normally burn such hydrogen to prevent explosions. These systems seem to have failed when the electrical power did.

Reactor 1’s containment survived the explosion. There were no large leaks of radioactive material, although there was an increase in radiation following the explosion. The explosion at Reactor 1 injured four workers. But this was only the beginning. Hydrogen gas was also collecting at the other five reactors. Over the next few days, hydrogen explosions destroyed the upper cladding of the buildings for Reactor 3 and 4 and the containment inside Reactor 2. Several fires broke out at Reactor 4. In addition, spent-fuel rods stored in the spent-fuel pools of Reactors 1-4 began to overheat as the water level dropped. Fear of radiation leaks led to evacuation of all non-essential persons within a twenty-kilometer radius of the plant.

In short, the Fukushima plant was overwhelmed by forces from outside well beyond what it was designed for. Without heroic efforts by plant staff, some of whom may die from radiation exposure, the plant would have become a huge nuclear disaster. Even with those heroic efforts, several weeks passed before the plant could be said to be under control. One generation at Reactor 6 was restarted on March 17 (six days after the quake) allowing some cooling at Reactor 5 and 6, the least damaged. Connection to the power grid was restored to parts of the plant on March 20, but machinery for Reactors 1-4—damaged by flooding, fires, and explosions—could not be restarted for several months. Only in early October 2011 did coolant in all the reactors stabilize against a 500-year, 1,000-year, or 10,000-year quake.

Katrina

When it struck New Orleans on August 29, 2005, Katrina was a category 3 hurricane, a large storm but no larger than storms that strike the Gulf Coast almost every year. The top of the hurricane scale is 5. Katrina was nonetheless unusually destructive because it moved so slowly that anything in its path was subject to heavy rains and high winds for many hours. The rain and high winds were so severe that Task Force IPET (IPET) issued its (draft) Final Report. IPET was an independent team of more than one-hundred-fifty international and national experts from more than fifty different government organizations, universities, and private companies. The U.S. Army Corps of Engineers commissioned IPET a few weeks after Katrina hit New Orleans. It was to analyze how the levee system performed. Though many questions of detail remain unsettled, this nine-volume report, is (more or less) the last word on both the causes of the Katrina disaster and means of preventing similar disasters.

IPET reports a “system” that grew up piecemeal, only in part under the control of the Corps of Engineers, the government agency officially in charge of waterways. In some places, the system failed because a levee or floodwall was not high enough, often because of unanticipated subsidence rather than original design error. In other places, the system failed because, though high enough, the barriers were not designed for the forces to which they were in fact subject (an unusually slow-moving storm). Design of floodwalls along three canals was “particularly inadequate”. A series of increments of decision-making did not result in a set of structures actually constructed “systematically increased the inherent risk in the system without recognition or acknowledgment” (IPET 2006, I-2). Many of the failures in the system the IPET Team noted would have occurred had implementation of plans for reconstruction not been delayed for almost twenty-five years by inadequate funding, new laws governing the environment, and simply insufficient money to pay for the repairs.

For some important “decisions”, there was no decision in these four case studies: planning, designing, construction, and operation. For suggesting alternatives, for example, a location where the risk of earthquake makes safe construction too expensive. They are also important for suggesting alternatives for, for example, conservation or a gas-fired plant rather than a nuclear plant. Engineers are not on this list, at least, because they are “problem solvers”. One important function they have is helping to define problems—or redefine them when it becomes clear that the client or employer has not asked the right questions.

But, for any large undertaking such as a nuclear plant or flood control system, engineers are generally only one party in a complex social decision in which the other parties include employer, government officials, experts of various sorts (such as geologists), bankers, and civil society (or “the public”). Perhaps the most important contribution engineers can make to planning is developing minimum standards for evaluating and responding to specific risks and benefits of the technology in question.

By designing, I mean the actual drafting of specifications, drawings, and so on without necessarily to construct or modify the technological artifact in question. Once planning has set limits, engineers are generally free to work within those limits, for example, to design

Conclusions

We can, I think, distinguish four sorts of engineering decision in these four case studies: planning, designing, construction, and operation. (In a different context, I would include “disposal” in this list. I do not include it here only because none of these disasters concerns disposal as such, though Fukushima’s problems were due, in part, to fuel rods waiting disposal.)

By planning, I mean such decisions as whether to build a dam at all, where to put it, and the upper limit of its budget. For such decisions, engineers are most important for vetoing certain options, for example, a location where the risk of earthquake makes safe construction too expensive. They are also important for suggesting alternatives, for example, conservation or a gas-fired plant rather than a nuclear plant. Engineers are not on this list, at least, because they are “problem solvers”. One important function they have is helping to define problems—or redefine them when it becomes clear that the client or employer has not asked the right questions.

Three Nuclear Disasters and a Hurricane  Michael Davis

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7
One author recently calculated that there are:

- Not very. Perhaps only 10
- interference, or the like.
- of distraction, fatigue, poor training, misjudgment,
- sooner or later. One of the “systems” that may fail at any
- planning principle suggested above (at least when
- humans will operate the plant). The analogy with
game of chance with known odds (“Don’t bet more than you
- spirit is much the same). It is, in this respect, more like
- a catastrophic failure at any moment?
- Not very. Perhaps only 10 at any time. But over many
- years and many reactors even such small risks add up.
- one author recently calculated that there are:
- 450 nuclear power plants in the world. There have
- meltdown in history, one each at Chernobyl and Three
- fast as for Fukushima, as partial meltdowns count as meltdowns. That is a 
- 1% failure rate. (Lindsay, 2011)

This calculation means nothing unless the four
- systems must
- for suffering that harm, we (that part of society making
- a nuclear power plant does not, of course, go seriously wrong for just
- of their machines. One of the features we noted in our
discussion of the three nuclear disasters is how quickly
things can go wrong. What goes wrong in a nuclear
plant does not, of course, go seriously wrong for just
one reason. Because engineers typically design nuclear
plants with a large safety factor, several systems must
fail before anything goes seriously wrong. But, given
the complexity of a nuclear plant, it is reasonable to
expect sorting out a new one now and then because
even with proper maintenance and inspection, technical
systems sometimes fail unexpectedly. That being so, it
is also reasonable to expect (given the laws of statistics)
that all of the independent systems will fail together
sooner or later. One of the “systems” that may fail at
given any time is the human operator—whether because of
- distraction, fatigue, poor training, misjudgment,
- performance?

- 57x145]One of the three nuclear disasters is how quickly things can go wrong. What goes wrong in a nuclear plant does not, of course, go seriously wrong for just one reason. Because engineers typically design nuclear plants with a large safety factor, several systems must fail before anything goes seriously wrong. But, given the complexity of a nuclear plant, it is reasonable to expect sorting out a new one now and then because even with proper maintenance and inspection, technical systems sometimes fail unexpectedly. That being so, it is also reasonable to expect (given the laws of statistics) that all of the independent systems will fail together sooner or later. One of the “systems” that may fail at any given time is the human operator—whether because of distraction, fatigue, poor training, misjudgment, or even simple error.

How likely is a catastrophic failure at any moment? Not very. Perhaps only 10 at any time. But over many years and many reactors even such small risks add up. One author recently calculated that there are:

- 450 nuclear power plants in the world. There have been 4 meltdowns in history, one each at Chernobyl and Three Mile Island and two so far at Fukushima, as partial meltdowns count as meltdowns. That is a 1% failure rate. (Lindsay, 2011)
other engineers may not be able to make the necessary changes immediately because of budget or schedule, or at all because changes that they have already made bar the improvement in question. Engineers may also find an alternative way to achieve the same end. For these reasons (and perhaps others), nuclear plants, however alike at birth, tend to grow into noticeably different individuals, much as biological plants do.

Some people, especially philosophers, seem to think of those who stayed on at Fukushima—those who, for example, worked in the dark in waist-high radioactive water to restart the generators—as engaged in “supererogatory” conduct, that is, as engaged in conduct above and beyond what morality requires. The engineers I have discussed this with seem to view the conduct as heroic but required (supposing the “workers” in question to be engineers). An engineer who left when needed would have acted unprofessionally; he would have failed as an engineer even if he left to save his life or look after his family. Engineering sometimes requires heroism (a significantly higher standard than proposed in Alpern 1983)—or so the engineers I have talked with about this seem to think.

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References

A Pluralist Ethical Decision-making Procedure
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Abstract
This paper claims that the use of several moral tests to assess the ethics of a new policy is unavoidable. All the efforts to make credible a methodological monism – by critical or reductionist strategies – have been unsuccessful; moreover, it must be acknowledged that even if there were a single test, when applied successively or by different people it would usually give divergent results. The main aim of the paper is to propose a pluralist procedure of ethical decision-making, using a set of proper ethical tests (such as utilitarian, Kantian, Christian, principlist and casuist) in the frame of an “ethical Delphi” procedure intended to make the governmental decision-makers take a supposed variety of verdicts. This pluralistic testing process, made by moral experts, is only a fraction of a more complex procedure intended to deliver social sanction for a new moral policy. This longer procedure also shows that the adoption of a new moral policy, rule or law is not only a question of passing a strict ethical test, but also a political (i.e. multi-criteria) decision. In general, the adoption of a new moral rule does not rely solely on an ethical test, but is essentially the outcome of a complicated social agreement. That is why in academic applications of the usual moral tests we do not take a moral decision on a new case, but merely simulate it.

Key words: ethical decision-making, ethical pluralism, ethical Delphi, pluralist model

Decisions about the moral value of an action, rule or public policy cannot be reduced to a verdict resulting from the application of traditional tests based on the major ethical theories, despite the fact that handbooks still unanimously support this view. The history of ethical test results is more one of surprises than one of predictability. You would expect, for instance, that people who adopt the same moral doctrine do this in order to approach issues in the same way, including the moral assessment of actions. We all believe that this is the main reason it is useful to embrace the same moral creed. Therefore it seems strange to find that several members of the Romanian Parliament, all active supporters of Christian morality, assessed the legalization of prostitution in opposing ways. On the other hand, it is also strange that two people who adopt different ethical theories – precisely because they offer distinct explanations of moral phenomena – can frequently assess actions in the same manner. When a utilitarian and a Kantian – or a follower of Christian ethics and one of Muslim ethics – debate issues, it is somehow surprising to see them judging situations in the same way in most cases, despite the fact they declare themselves to be supporters of opposing ethical beliefs. Are these beliefs really opposing? In general, it appears that use of tests based on distinct or even opposing theories, such as utilitarianism and Kantianism, can result in different verdicts, but in most cases it results in convergent ones (Kantian and utilitarian moral duties are, ultimately, the same). On the other hand, if we dogmatically adopt a single theory and apply the same test repeatedly to the same action we usually get similar results, but some divergent ones also appear (see the cases of divergent utilitarian assessments of the same case given as examples in the textbooks).