



## Sustainable Techniques in Mining: Inspiration from the Nature

### KEYWORDS

Sustainable, Alternative future, Bionics

**Dr. Suhas B. Dhande**

Professor & HOD, K.R. Sapkal College of Management Studies, Sapkal Knowledge Hub, Anjaneri, Trimbakeshwar Road, Nashik – 422 213

**ABSTRACT** *We largely depend upon the mother nature for the energy resources. Earth is the only sources for almost all the energy resources, viz crude oil, coal, trees. Though lot of efforts are being taken place towards non-conventional energy sources, atleast as of now, we are dependent on earth. Hence mining is essential and can not be avoided. At the same time, mining is very badly affecting the structure of the earth, mountains and further leading to reduced forests, rains, wild life and so on. So it is a challenge for us to adopt sustainable mining.*

*Bionics approach, nature's principles, can be brought into our working. Adaptation of good practices in living beings of natural world can inspire us for alternative or sustainable ways of mining. This will lead to maintain the balance between energy sources requirement and still sustained environment.*

*The purpose of this novel approach is to formulate conceptions to create, explore and evaluate alternative future.*

### Introduction:

Bionics, termed by Major Jack E. Steels, research psychiatrist at Aerospace Research Laboratory at Ohio, combining Biology and Technology. Bionics is a combination of the Greek word "bios" (life) and the word "mechanics". Bionics deals with technological conversion of the working principles of construction, processing, development and growth existing in all living things of natural world.

It's a creative design process inspired from living things in the natural world. Bionics principles can enrich and complement classical design methods. Nevertheless, bionics does not simply mean making a 1:1 copy of nature. It means learning from nature and implementation of the knowledge gained from this in new design solutions. Victor Papanek has promoted this approach in design in his book "Design for the Real World". He believes firmly that designs from nature never seem to go out of style. Bionics is most practical approach in reconciling technology with nature by imitating its principles.

We largely depend upon the mother nature for the energy resources. Earth is the only sources for almost all the energy resources, viz crude oil, coal, trees. Though lot of efforts are taking place towards non-conventional energy sources, atleast as of now, we are dependent on earth. Hence mining is essential and can not be avoided. At the same time, mining is very badly affecting the structure of the earth, mountains and further leading to reduced forests, rains, wild life and so on. So it is a challenge for us to adopt sustainable mining, as mining can not be avoided completely.

Adaptation of good practices in living beings of natural world can inspire us for alternative or sustainable ways of mining. This will lead to maintain the balance between fulfillment of energy sources requirement and still sustained environment.

### The process in Natural world:

Honey bees face the problem of rapidity of change in foraging conditions. The high quality patches signalled by vigorous dancing come and go in few days; the pattern observed today bears no resemblance to the pattern observed 4 days later, and only a slight similarity to what is observed 3 days later. On average, the colony worked about ten patches for pollen over the course of a given day; some of these were heavily exploited while others aroused little interest. Although a typical pollen producing patch of flowers lasts

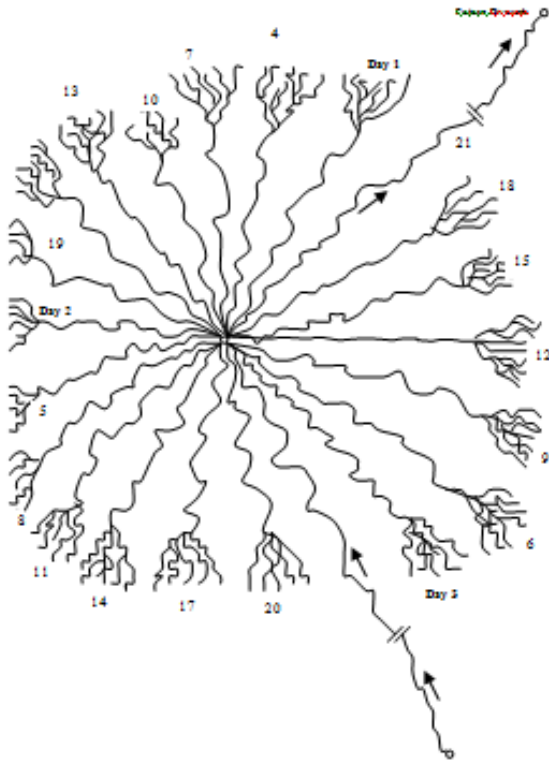
about a week, it is at its peak of productivity for only one to three days. In order for bees to track the sorts of rapid changes going on in the real world they obviously need scouts investigating the environment, on the lookout for new patches; the dance, then, provides a way of sharing this information with sisters so that the colony as a whole can focus its efforts on the best food currently available and good sources will normally will not slip past unnoticed.

By looking at the distance indications in the dance, we can get a picture of how extensive expeditions are. Patches turn out to be widely scattered; a kilometre or more usually intervenes between one patch and its nearest neighbour. The scout search far and wide: patches were reported up to 11 kilometres away, though 95 percent of the discoveries lay within 6 kilo meters and the majority were confined to a radius of 2.5 kilo meters. Still, for an animal less than 2 centimetre long, these are enormous distances.

Given that the rapid change in forage necessities an active scouting force to monitor the floral market, how large is the hive's commitment to "research" versus "production"? The answer, predictably, is that it varies. Different researchers have found the proportion of scouts to range from 13% to 23% of the forage force, but these different results area consequence of when the measurement were made.

Though the waggle dances gives clear idea about the direction and the distance, the direction lack precision. But one possible reason for this lack of precision is may be because bees' natural food sources are usually patches, rather than individual point. There may be no virtue in dispatching recruits to the same exact flowers a dancer has just harvested, but every reason to scatter them, within limits, about the part of the patch of a particular sort of flower the forager has just visited. In this way recruits arriving in another part of the same patch will find food, return and dance; their recruits, in turn, will explore the area around this find and so on until the full limits of the patch are discovered and the resource fully exploited.

Figure 1 : Ant Pinwheel



Source : The Civilized Insect, by Edward O. Wilson, National Geographic, August 2006

A Colony bivouacs at one site for about 20 days as the larvae enter the pupal stage (Figure 1). There the queen lays as many as 3,00,000 eggs. Raids fan out in a pinwheel pattern that assures the ants cover fresh hunting ground and also no ground left unattended. When new workers emerge from the pupae and the new eggs hatch into larvae, the colony marches gain with larvae in tow. For the next two to three weeks the ants cover roughly a hundred yards a day, raiding as they go and bivouacking nightly along the way.

When a flower has already been visited, the honeybee can understand that another bee has earlier consumed the nectar of that flower, and leave the flower immediately. This way, it saves both time and energy. Well, how does the bee understand, without checking the flower, that the nectar has earlier been consumed?

This is made possible because the bees which visited the flower earlier marked it by leaving a drop on it with a special scent. Whenever a new bee looks in on the same flower, it smells the scent and understands that the flower is of no use and so goes on directly towards another flower. Thus, bees do not waste time on the same flower.

Nature magazine (November 2005) reported the findings of scientist at Britain's University of Sheffield. They found that foraging ants place a tiny scent marker on branches that do not lead to awards. This pheromone acts like a 'no entry' signal to other ants, telling them not to waste their time going down that route.

#### Reality:

On the other hand, we are using very traditional techniques of mining and its badly affecting the complete ecology. Mining is affecting the structure of the earth, mountains and further leading to reduced forests, rains, wild life and so on. At the same time, we can not avoid mining else our development will be at halt. So the best way out is adopting new techniques for sustainable mining. We need to ensure just sufficient mining and not even 1% excess than the requirement. The energy sources can be explored with pinwheel strategy to cover all the target area effectively covering all useful area and saving the non-useful area intact. Further no area will be left un-explored. Then the damage to the earth can be minimal and some sustenance can be maintained. Hence the research work proposes to adopt the pinwheel technique of the ants, to ensure effective mining without much damage to the earth.

#### Summary:

We largely depend upon the mother nature for the energy resources. Earth is the only sources for almost all the energy resources, viz crude oil, coal, trees. Though lot of efforts are taking place towards non-conventional energy sources, atleast as of now, we are dependent on earth. Hence mining is essential and can not be avoided. At the same time, mining is very badly affecting the structure of the earth, mountains and further leading to reduced forests, rains, wild life and so on. So it is a challenge for us to adopt sustainable mining, as mining can not be avoided completely.

Nature has given rise to intelligent technique to tackle several kinds of problems. The sophisticated method named evolution, is already running three billion years, in the biggest laboratory, the surface of the earth. The optimal solutions can be benchmarked from insect societies, into human management. Adaptation of good practices in living beings of natural world can inspire us for alternative or sustainable ways of mining. This will lead to maintain the balance between energy sources requirement and still sustained environment. We will be getting the energy sources without exploiting the earth and then mining with this technique will ensure sustainability.

#### REFERENCE

- [1] Pramod Pathak, April 2001, Indian Management, 'Management, Does it Really Matter?' | [2] WG DCR D.M.Mathur, April 2001, Indian Management, 'Missing the Wood for Trees'. | [3] Victor Papanek, 1985, Design For The Real World, The Tree of Knowledge: Biological Prototypes in Design, Thames & Hudson Ltd; ISBN: 0500273588. | [4] James L. Gould & Carol Grant Gould, 1988, 'The Honey Bee', W H Freeman & Co (Sd), ISBN: 0716750236. | [5] The Civilized Insect, Edward O. Wilson, National Geographic, August 2006 | [6] Edward De Bono, 1990, 'Simplicity', Penguin Books Ltd; ISBN: 0140258396. | [7] Robert Peterson, 2004, Derek's Blog: Future Organisations? | Glossary: | Bionism – Term coined by author, describes 'Biology based management system'. |