alternate fuel. When blended with 15% gasoline, it is used as M85. China has approved a national standard for methanol-blended gasoline so as to develop a substitute for gasoline. Methanol possesses high octane rating and can be made either biologically or chemically from almost all organic compounds ($CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$). It can also be produced from carbon dioxide present in the air or captured from industrial emissions which are a major cause of pollution and thus has an upper hand over ethanol produced from food crops such as corn and sugarcane.

Thus it can at the same time act as a CO_2 sink, reducing the amount of CO_2 being released into the atmosphere. However, major advancements are necessary for this technology to be made economically viable. As of today we do not have absorbents which can absorb even low concentrations of CO_2.

Methanol as a fuel offers several benefits in terms of emissions when compared to gasoline[3]. It reduces hydrocarbon emissions by 40% with M85 and 80% with M100. Emissions can be further cut down with fuel-cell vehicles using methanol rather than the existing vehicles based on internal combustion engines. Even the amount of nitrogen oxide released is low due to higher heat of vapourization. Very low particulate emissions are produced. The basic reason for lower levels of exhaust emissions is that it combusts more completely than gasoline and it contains no aromatic compounds; thus no benzene is produced.

Most people argue that methanol is toxic when compared to ethanol, but so is gasoline. Although it is slightly more toxic than gasoline, being easily biodegradable, spills of methanol persist for shorter duration in the environment when compared to petroleum spills[4]. Another argument is that it is corrosive, but it is only a disadvantage if we use it in the present engines, not in case of especially modified or designed engines for methanol or in case of flexi-fuel cars. The extra production cost is also not much. When we compare methanol and ethanol, we can also see that the system and conversion efficiency are higher in the former, and also the production cost is lower. Methanol is cheaper than gasoline, but has low energy content. Therefore, overall cost of using methanol is slightly higher than gasoline, but the net benefit is more.

An example is that many racing cars have been running on M85 for sometime now. This clearly shows its potential to be used as a fuel. Once the technological advancements have been made and efficient fuel-cell vehicles are available in the market, there is no stopping the methanol revolution.

1. Rastogi, R., Singh, S. and Syal, S., *Curr. Sci.*, 2008, **94**, 699.
2. Maheshwari, R., *Curr. Sci.*, 2008, **95**, 594–602.
3. Olah, G. A., *Angew. Chem., Int. Ed. Engl.*, 2005, **44**, 2636–2639.
4. http://www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm

AISHWARYA
SUDHIR SYAL*

Department of Biotechnology and Bioinformatics,
Jaypee University of Information Technology,
Waknaghat,
Solan 173 215, India
**e-mail: sudhirsyal@rediffmail.com*

Bharatpur wetland: future desert?

The Keoladeo National Park (KNP), better known as the Bharatpur Bird Sanctuary, is one of the world's most renowned wetlands, famous for its avifauna. It is spread over 28.72 km^2 and located on the western edge of the Gangetic plains, at the confluence of rivers Gambhir and Banganga. The KNP is part of the Indo-Gangetic Plain with elevations ranging from 173 to 176 msl. The area is semi-arid, with an average rainfall of 500–700 mm, though rainfall can vary greatly from year to year. Considering the importance of the wetland, the area was designated as a National Park in 1981. It comprises three major ecosystems, namely wetland, grassland and woodland. Around 370 species of birds and 375 species of flowering plants have been recorded in the area. The star of the place used to be the rare Siberian crane (*Grus leucogeranus*), commonly known as 'snow wreath' or 'lily of birds', which had made the Park its home during the winter months. But today, sadly not a single bird of this species migrates to the Park. The Park is renowned globally for its heronries and is called the 'Mecca of bird watchers'. Because of its great ecological value, the huge congregation of birds and a wide variety of species, KNP was selected as a Ramsar site[1] in 1981. In December 1985, UNESCO declared it a World Heritage Site[2]. Rare birds from as far as Afghanistan, Turkmenistan, China and Siberia visit the Park during the winter months. The wetland is home to many vulnerable and critically endangered species[3] like Oriental white-backed vulture (*Gyps bengalensis*), Siberian crane, Spot-billed pelican (*Pelecanus philippensis*), Lesser adjutant (*Leptoptilos javanicus*), Indian skimmer (*Rynchops albicollis*), Sarus crane (*Grus antigone*), Baer's pochard (*Aythya baeri*), etc. This site is also considered an eco-fragile area because water – the life supporting system for KNP – is being totally controlled by humans.

A unique feature of the wetland ecosystem of KNP is its origin from a natural depression, which was an evanescent rainfed wetland[4]. Subsequently, the construction of Ajan Bandh and several sluice gates in the periphery of the KNP facilitated to contain and regulate the water level. Regular flooding and flushing of the wetlands is the only way to manage them. Today KNP is facing a huge shortage of water. With a growing shortage of water and feed, the birds no longer find the Park suitable. The dwindling bird population here had prompted UNESCO to issue a notice to the Bharatpur wetland in 2008 that, if the water table continues to fall and the number of migratory and local birds here keep falling, it would have no option but to withdraw its World Heritage status. The rich diversity of avifauna is in jeopardy if the government-proposed water diversion for irrigation takes place soon. The KNP requires about 550 million cubic feet (mcft) water for maintenance of wetland ecosystem. In recent years, only 300 mcft of water flow is possible due to poor rain, which has resulted in the drying of the woodland and wetland flora. Construction of the Panchana dam near Karauli in 2003, which is about 90 km upstream from KNP on the Gambhir

river, has progressively decreased the water flow to the Park. The command area of the Panchana dam requires water for irrigation, leaving no water for the KNP. Water released from the dam suffers high transit losses due to long distance and sandy terrain of river course between Panchana and the KNP. Therefore, the State Government has decided not to release water from the Panchana dam, except when the dam overflows. Total stoppage of water from the Gambhir river is likely to make the Bharatpur wetland drier and cause a negative impact upon the life of flora and fauna present there.

The Rajasthan Government has proposed a dedicated pipeline scheme for bringing water from the Chambal river. Only time will tell the truth regarding the proposed pipeline. The Centrally Empowered Committee has also recommended the highest degree of protection to the KNP, as it is a valuable national and international heritage and Ramsar site. So the release of water from the Panchana dam to the KNP is absolutely necessary for its survival. The various alternatives being considered will not serve any purpose in rejuvenating and maintaining the wetland ecosystem of the Park. The lack of coordination and non-cooperation from local people can result in an irreversible ecological equation, thus converting the bird sanctuary into a desert in the near future.

1. http://ramsar.org/sitelist_order.pdf, accessed on 28 July 2008.
2. http://whc.unesco.org/en/list, accessed on 28 July 2008.
3. Islam, M. Z. and Rahmani, A. R., *Important Bird Areas in India: Priority Sites for Conservation*, Indian Bird Conservation Network, BNHS and BirdLife International, UK, 2004.
4. Vijayan, L., *Ramsar Sites of India, Keoladeo National Park, Rajasthan*, WWF-India, New Delhi, 1994.

CHIRANJIBI PATTANAIK[1,*]
S. NARENDRA PRASAD[1]
C. SUDHAKAR REDDY[2]
P. MANIKYA REDDY[3]

[1]*SACON,*
Deccan Regional Station,
Hyderabad 500 017, India
[2]*Forestry and Ecology Division,*
National Remote Sensing Agency,
Hyderabad 500 037, India
[3]*Department of Botany,*
Osmania University,
Hyderabad 500 007, India
**e-mail: jilu2000@rediffmail.com*

Ancient gold-mining activity

The communication by Nagabhushanam *et al.*[1] has not revealed any new dates regarding the ancient gold-mining activity in the Hutti Goldfield, except by extending it up to the 7th century AD.

India is one of the World's earliest sources of mineral treasure. On the basis of archaeological and other evidences, the first discovery of gold-bearing reefs in the Deccan region was during the Neolithic period, i.e. between the end of the 3rd millennium BC and the first-half of the first millennium BC – broadly coinciding with the Vedic period, i.e. 5000–2500 BC. I have been studying India's ancient mining heritage since the past several decades[2–4]. I do not agree with the statement of the authors about the absence of historical records pertaining to the episodes of ancient mining activity in Karnataka.

The pre- and the post-Mauryan period (500 BC to AD 1200) was the 'golden period' of mining in ancient India. The most important evidence is the occurrence of rock edicts[5] in different parts of the country (a total 23 with five in Karnataka), which were installed by Emperor Asoka (268–233 BC) close to the mines of gold, lead, zinc, silver, copper and diamond worked during that period. The edict at Muski is located right in the Hutti Goldfield, where several ancient mines are sited and gold is still being mined at present. Some historians believe the name 'Swarna Nagari' (gold town) or 'Suvarnagiri' (gold hill), mentioned in the Brahmagiri edicts (Chitradurga District) is ascribed to Muski – the site of a forgotten ancient Neolithic town, which could have been Asoka's capital in the Deccan[6]. However, one exception noticed is the conspicuous absence of Asokan edict in the region of the Kolar Goldfields.

Certainly, gold was mined in the pre-Christian era. A reference to the Indian gold is also made in the *Bible*, which records that around 970 BC, King Solomon obtained large quantities of gold from 'Ophir', which was in fact India[7].

It is admitted that the present dating techniques prove or disprove the historic time-scale and, are hence relevant in basing our observations/conclusions on the ancient mining heritage in our country.

1. Nagabhushanam, P., Prabhakar Sangurmath, Patil, M. L. and Sukhija, B. S., *Curr. Sci.*, 2008, **95**, 389–391.
2. Raghu Nandan, K. R., *Ancient Mining in Khetri Copper Belt, Rajasthan, India*, The Mythic Society, 1988, pp. 177–182.
3. Raghu Nandan, K. R., *J. Mines, Met. Fuels*, 2001, 136–140.
4. Raghu Nandan, K. R., *India's Ancient Mining Heritage* (It is one of the World's earliest Mineral Sources), Rock and Gem, 2003, pp. 44–45.
5. Mishra, S. P., *Rec. Geol. Surv. India*, 1983, **113**, 92–98.
6. Allchin, F. R., *J. Econ. Soc. Hist. Orient*, 1962, **5**, 195–211.
7. Curtis, L. C. and Radhakrishna, B. P., *Mineral Resources of India – Hutti Gold Mine – into the 21st Century*, Geological Society of India, Bangalore, 1995.

K. R. RAGHU NANDAN

787, 7th Cross, M. C. Layout,
Vijayanagar,
Bangalore 560 040, India
e-mail: sunitaraghu@gmail.com

Response:

Raghu Nandan has mentioned that we have not revealed any new dates regarding the ancient gold-mining activity in the Hutti Goldfield, except by extending it up to the 7th century AD. We wish to clarify that though some ^{14}C dates have been available from Kolar and Hutti mines, it does not mean further studies need not be carried out at other mines. With the scientific objective of exploring the time period of mining activity at Uti, radiocarbon dating was carried out on the wood log found by one of the authors[1]. Only after ^{14}C dating of the wood log of the Uti mine, the contemporaneity of