KOGELBERG
Branch of the Botanical Society of SA

Newsletter:
June 2014

News Editors: Ed & Merran Silberbauer

THE BATTLE OF BETTY'S BAY
ROUND 615

The next attack takes place on Sunday 6th July, 2014, from 9am to noon
VENUE: Lakeside Drive, as for recent months.

CHANGE OF ADDRESS/ AND/ OR STATUS OF MEMBERSHIP

If you change your address, wish to resign or change your status, please notify the Botanical Society Head Office on 021- 797 2090, as they print the labels and keep the records.

TALKS

Saturday 21st June Dick Stroh on **Fire in the Helderberg** and **Renewal in the Fynbos.** There will be an interval when Gluhwein will be served. In the Nivenia Hall at 6p.m.

Saturday 19th July AGM at 5.30p.m. Nivenia Hall after which Alan & Jenny Mountain will speak on **Madagascar.** Liquid refreshment will be served after the AGM and before the talk.

At all talks a voluntary collection will be taken and the attendance register will be circulated. Please note that the purpose of the register is twofold, firstly to advise the HPG for their records of the number of people attending and secondly so that regular attendees can be contacted should any alterations to the programme be made or, as has happened, a visitor offers a talk at short notice.

Contact Merrilee: 028 272 314.

THE ANNUAL GENERAL MEETING OF THE KOGELBERG BRANCH

Saturday 19th July Time: 5.30p.m.(17h30) Venue: <u>Nivenia Hall.</u>

AGENDA

Welcome and Apologies

Confirmation of the minutes of the 2013 meeting.

Presentation of the Treasurer's and Chairman's Reports

Election of Committee members

Any other business, with permission from the Chair.

Nominations for election to the committee and motions that members wish to raise under AOB should be in the hands of the Chairman before the end of June.

Merrliee Berrisford, Chairman 028 272 9314.

WALK SATURDAY 21st JUNE

To learn if there is to be a walk (if view of the wintry weather) please contact Barbara Jenman 082 338 4109 on Friday 20th.

•DISCLAIMER

All participants in BotSoc events do so at their own risk. Whereas those in charge will do everything possible to ensure the safety of all participants, they cannot be held responsible in the event of unforeseen mishaps.

REPORT ON HACK NO 614

Due to the pouring rain, the hack was cancelled. We return to the same spot next month.

Ed Silberbauer, Convenor

PRINGLE BAY HACK NO

Due to inclement weather there was no hack. The next hack will be on Sunday 29th June 2014.

As usual we will meet on the pavement opposite Drosters Centre, in Central Avenue, Pringle Bay, at 08:30 and will then proceed to the hack site. The hack stops at 11:30. Everyone who would like to help rid Pringle Bay of alien vegetation will be welcome. Hacking tools are provided. Contact John at (028) 273 8807 or Ian at (028) 273 8589, or just turn up at the meeting point.

John Whitehead, Convenor.

ROOIELS HACK

Saturday 5th July, 8.30-10.30. Tools & refreshments provided. Contact: Anuta Scholtz anuta@omail.co.za or tel 083 388 8239 or Evette tel 028 273 8483

THE QUITE REMARKABLE VITAL CHEMISTRY OF PHOTOSYNTHESIS: WHY GREEN PLANTS MATTER.

Michael Orren.

Without photosynthesis, that exquisite chemical set of reactions that creates all our food and every molecule of oxygen we must breathe, we humans along with all higher animals would simply cease to be.

I first became intrigued by photosynthesis, in which atmospheric carbon dioxide (CO_2) is converted efficiently and seemingly effortlessly to very complicated organic molecules ('organic' means mostly comprised of carbon atoms!) using the green chlorophyll molecule, solar power and a suite of beautifully tailored enzymes, while first looking at plant plankton (phytoplankton) in the sea in the early 1960's. It was clear even to a biological ignoramus like myself that phytoplankton growth supported everything else living in the sea and was indeed truly the bottom link of the marine food chain. As a chemistry major, my knowledge of biology was minimal to say the least, so, doing what scientists do, I began to "read up" on photosynthesis in the library. At that time Melvin Calvin's Chemistry Nobel Prize winning research, unravelling how photosynthesis worked, was quite new.

Photosynthesis, one of the most ancient natural reactions we know of, was operating extensively in the sea over 3.5 billion years ago-and amazingly in pretty much the same way as today. The evidence is from the "chemical fossils" of chlorophyll observed in extremely old, accurately dated, sedimentary rock. *Cyanobacteria* (or 'blue-green algae') somehow back then or, most probably, long before then, had managed to create the complicated molecule of chlorophyll which has the almost magical ability to capture the energy in sunlight and convert this with high efficiency into useful chemical energy. In scientific terms, the stream of solar photons is converted into a stream of electrons, their energy is then harnessed by molecules to carry out a mass of complex chemical reactions. These reactions hum on unseen and quietly in every single sunlit green leaf on earth. The raw materials, carbon dioxide and water (H_2O), are both fully oxidized, very stable, molecules and much energy is required to split these. Huge, complicated enzymes specifically able to do this job were not only produced but put to work. Carbon dioxide and water were then split up by electrons derived from solar power and their carbon, oxygen and hydrogen atoms neatly reassembled into simple carbohydrates (loosely 'sugars') as shown in elementary textbooks, but in addition a whole suite of far

more complicated biochemicals necessary to support even those primitive life forms. The enzymes which facilitate the creation of seriously complicated molecules are themselves assemblages of thousands of superbly positioned atoms. Far more elements than the standard “N, P & K” are critical for plant growth. These include sulphur, holding large biochemical molecules together through disulphide chemical bonds, iron, copper, manganese and zinc which are all vital to activate the critical enzymes, and magnesium, one atom of which sits in the very heart of each chlorophyll molecule-without this solitary magnesium atom amongst 55 carbon atoms, 72 hydrogens, 5 oxygens, and 4 nitrogens-chlorophyll does not function and the entire photosynthetic system crashes. Many other elements are taken up like silicon for structural parts (below), boron, sodium, potassium and chlorine for cell contents, calcium for structures, even molybdenum for nitrogenase (nitrogen fixation) functioning, for the system to operate-all this and much more in a cell you can only see under an electron microscope. Primitive cells split to reproduce using specific enzymes to manufacture all the products required for living plant matter to multiply. Much later on in Earth’s history, flowering plants evolved on land and land photosynthesis was added to that which continued to flourish in the sunlit surface layers of the global ocean. Herbivore animals could now evolve and fresh meat became available to carnivores, the latter including humans.

The active photosynthetic units take in carbon dioxide gas, often using another large enzyme *carbonic anhydrase* which needs zinc to function, to hugely speed up the inflow. Without carbonic anhydrase in our lungs we would rapidly suffocate in our own metabolically generated CO_2, which is speeded out of the lungs by this enzyme. Plant components manufactured range from simple glucose and sucrose (“sugar”) to amino acids, the building blocks of protein and of DNA, lipids (“oils”) and resins, polymers like starch and cellulose, ADP/ATP (adenosine di-and tri-phosphate), a vital cell energy carrier and many, many more. The end product, apart from the above essential biochemical material, is dissolved oxygen gas. Surprisingly, dissolved oxygen gas by its powerful oxidizing activity is an effective destroyer of much fragile biochemical matter and since it thus acts like a cellular toxin, is rapidly excreted through the cell wall. Of course, this gas that plants discard is the very same oxygen we all need to breathe with. With the insignificant exception of oxygen from minute amounts of water broken down by stratospheric sunlight, **all** the oxygen we breathe has come from the photosynthetic conversion of atmospheric carbon dioxide and water to plant matter by sunlight. On early earth much photosynthetic oxygen was initially utilized to oxidize the smelly, very poisonous sulphides and billions of tonnes of dissolved iron salts then ubiquitous in natural waters, also oxidizing the remaining, then abundant, atmospheric methane left over from earlier days to CO_2, but beginning about 2.2 billion years ago oxygen first began to build up significantly in the atmosphere. Today, aerobic decay after the plant life cycle ceases, absorbs atmospheric oxygen, but the superbly balanced biogeochemistry holds the natural atmospheric concentration of oxygen almost constant.

Many microscopic marine plants such as the very abundant diatoms, have frustules, resembling skeletons, of silicon dioxide, in its opaline crystal form, set in beautifully symmetrical arrays. Using specialized chemical methods, diatoms extract the minute quantities of dissolved silicon from seawater, turn it into solid opal then specific protein templates are used to create the structures unique to each species of which there are billions of individuals, yet all are identical under the microscope.

Without photosynthesis Earth would be much hotter, with all those extra greenhouse gases, carbon dioxide and methane, in the air; lifeless, since there would be no oxygen; largely bare, sterile rock since with no aerobic microbes or fungi to break down carbon compounds in rock debris soils would be rare; and without the 'ozone umbrella' oxygen supplies by reacting with sunlight to form ozone in the upper atmosphere, earth's surface would be blasted by intense solar ultra-violet light that would quickly 'cook' and then in seconds kill any anaerobes that dared to ooze out of the smelly, sulphidic surface waters. Not a pleasant world to contemplate but thanks to photosynthesis we are able to thrive and eat in our wonderful world.

THE EVOLUTION OF BIRDS -
Professor Chinsamy-Turan - 17 May 2014

As I was watching the little birds pecking at crumbs on my stoep, I noticed how each had its particular preference. Having recently heard Prof Anusuya Chinsamy-Turan's talk I was very happy not to be feeding an Archaeopteryx.

The fossil of this earliest known bird, a single feather, was discovered in Germany in 1860. A year later the first skeleton of a feathered creature was found in the same area causing a sensation as it was both reptile like with teeth and a long bony tail and also bird like with feathers and long arms. It was named Archaeopteryx meaning "ancient wing". The fossil remains date back 150 million years to a time when dinosaurs were the dominant land animals. Many fossilized birds have since been discovered around the world but are rare on the African Continent, because there were no lake deposits to preserve the very delicate bone structures and feathers.

However in 1995 an expedition to Madagascar discovered a fossil locality with three species of birds, one of which was of a fish eating bird. More recently amazing discoveries have been made in China. However no fossilized bones of dinosaurs that are earlier than 65 million years have been found. Some huge global catastrophe must have happened then to wipe out all living dinosaurs except for birds which are their descendants.

Our speaker Anusuya has become an expert in the study of the bone microstructure. She is a biologist, zoologist, and palaentologist in one dynamic person. By studying

fossilized bones a huge amount of information is found. By looking at an individual specimen's bones, the overall shape, size and movement of the creature can be determined. Working with Chinese colleagues over the past decade, she has examined under a microscope thin sections of bone about half the thickness of a strand of hair. Such microscopic structures are still preserved after millions of years.

An amazing find has been the ability to tell the sex of a bird. From bone microstructure of a bird-like dinosaur, Confuciusornis, in China, it was found that some had tails while others did not. Through studying the bones of modern birds, it was found that a female has to build up calcium deposits just before egg laying. This calcium is formed within the medullary bone and can be seen under a microscope. The same biological signals have been found in fossil bones. So the tailless Confuciusornis was found to have been a female!

Very recently another discovery has revealed microstructures that can tell the colour of bird feathers. A brownish LBJ ¨C large brown job ¨C was found to have had a crest of brightly coloured red feathers!

Professor Chinsamy-Turan has offered us another lecture on bone microstructure, possibly together with a Chinese colleague. However you can also hear her at Summer School 2015 at UCT.

Andrea Benn.

DATES TO DIARISE

Cape Floral Kingdom expo. 28Th to 31st August 2014 in Mega Park, Bredasdorp. Entrance is R100 for adults, pensioners R70 and children under 12 R20 . See p53 in Veld & Flora's June issue.
www.capefloralkingdom.co.za or 082 556 8778

Hermanus Botanical Society's annual flower festival will be held in the Fernkloof Reserve from 25th to 28th September 2014. Entrance R20 for adults, children 12 and under free. The theme is Plant Explorers then and now.
www.fernkloof.com botsochermanus@telkomsa.net Tel. 028 313 8100

RAINFALL AND TEMPERATURES

Month		**May**	**2013**	**2014**
Rainfall mm			83,5	139
Temp, °C	Max		28	36,5
	Min		10	10

REMEMBER YOUR ARTICLES AND CONTRIBUTIONS ARE WELCOME
The editors reserve the right to edit contributions.
Deadline for the next newsletter is Tuesday, 8th July 2014.
Please address all mail to : Kogelberg Branch of the Botanical Society of SA, P.O. Box 85, Betty's Bay 7141. E-mail : merran@telkomsa.net no graphics please.