

MOLECULAR BIOLOGY

A Guide to Silence

RNA-directed DNA methylation (RdDM) is an RNA silencing mechanism that so far appears to be specific to plants. RdDM requires a double-stranded RNA that is cut into short 21- to 26-nucleotide fragments, much like the small interfering RNAs seen in RNA interference (RNAi); DNA sequences homologous to these RNAs are then methylated and silenced. As well as being implicated in the methylation of protein-coding regions of genes subject to post-transcription gene silencing, RdDM is also involved in transcriptional gene silencing (TGS) through the RNA-directed methylation of promoter sequences.

Although several DNA methylases have been implicated in RdDM, it is still not known how RNA targets specific DNA sequences (as in RNAi). In order to delve deeper into the mechanism of RdDM, Kanno *et al.* have used a TGS-based screen to identify three complementation groups in *Arabidopsis*, one of which is the gene *drd1*. This gene is required for non-CpG methylation-based silencing in a target promoter and appears to act locally. It also has homology with SWI/SNF and *Drosophila* RAD54 chromatin remodeling proteins. Mutations in the various alleles of *drd1* all map to conserved functionally important regions of DRD1's putative SWI/SNF ATPase domain, which in other SWI/SNF proteins is essential for remodeling. RAD54 is required for homologous DNA repair, and thus the authors speculate that DRD1 could aid in homology searching, clearing of chromatin, and heteroduplex formation that may guide DNA methylases. — GR

Curr. Biol. **14**, 801 (2004).

APPLIED OPTICS

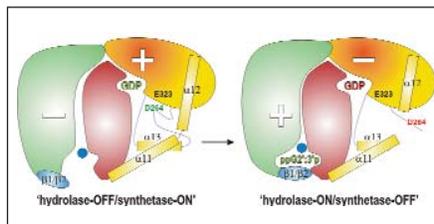
Better Writing and Reading

Reducing the operating wavelength of laser diodes is desirable for a number of applications. Shorter wavelength enables the writing and reading of optical information at higher storage densities, as seen in the development of CD and DVD players over the past decade, in which the wavelength has decreased from infrared to blue. In addition, ultraviolet (UV) radiation at wavelengths below 390 nm can be used in fluorescence-based chemical and biological detection schemes.

The development of suitable materials

that can be electrically driven and operated at ambient temperatures has, however, presented a significant challenge. Providing an addition to the small selection of wide-bandgap materials, such as diamond, that emit in the UV, and one that the wafer growers may find more attractive to work with, Fischer *et al.* present results on UV-emitting AlGaIn-based light-emitting diodes. Their devices can operate at room temperature and provide around a milliwatt of 290-nm UV light when biased at around 10 V and with an injection current of 300 mA. — ISO

Appl. Phys. Lett. **84**, 3394 (2004).



The either-or conformations of Rel/Spo.

BIOCHEMISTRY

Seeing Two Spots

More than a few decades ago, when paper electrophoresis was in vogue, two unusual nucleotides (ppGpp and pppGpp) were identified and called magic spots I and II. These spots—collectively called (p)ppGpp—appeared when *Escherichia coli* were starved of amino acids and ran into problems making proteins. Subsequent work established that the ribosome-associated enzyme RelA synthesized (p)ppGpp when uncharged transfer RNAs (depleted of their cognate amino acids) entered the ribosome and that (p)ppGpp served as a pleiotropic regulator of gene expression.

Hogg *et al.* describe structural and biochemical studies on two conformations of a Rel/Spo homolog from *Streptococcus*; Spo degrades (p)ppGpp and has sequence similarity to Rel. They find two catalytic sites, one for (p)ppGpp synthesis and one for hydrolysis, that are active in mutually exclusive fashion. Artsimovitch *et al.* observe two orientations of (p)ppGpp binding to the six-subunit RNA polymerase from *Thermus thermophilus*. They suggest that the differential impact of these orientations on binding of Mg²⁺, nucleotides, and the nontemplate DNA strand may account for the inhibitory and stimulatory effects of (p)ppGpp on transcription. —GJC

Cell **117**, 57; 299 (2004).