1960 年代に全共闘運動で一世を風靡した山本義隆も、すっかり老境に入ってしまった。彼は 1941 年の生まれで、我々洛星の 15 期生より、丁度一回り上である。全共闘運動から足を洗った後は、駿河台予備校で物理を教える傍ら、

『重力と力学的世界　古典としての古典力学』

を始めとする膨大な量の物理学史関係の著作をものにしている。私はと言うと、洛星卒業後は数学三昧の日々を送っていたが、ふと気がつくと既に還暦を過ぎてしまった。『少年易老学難成（少年老い易く学成り難し）』という南宋の朱熹の偶成の一節や『及時當勉勵、歲月不待人（時に及んで当に勉励すべし、歳月人を待たず）』という東晋の陶淵明の雑詩の一節を痛感している今日この頃である。山本義隆は最近数学書房という出版社から『幾何光学の正準理論』（2014）という本を出版したが、これを英語で review したので、それをご案内しておく。数学書房というのは、この出版不況の時代に数学の専門書だけを出版すると頑張っている、大変殊勝な出版社である。私は zbMATH ならびに MathSciNet という数学の文献の二大 review 誌の reviewer をしているが、前記の review は前者に掲載されたものである。フランス語やドイツ語、あるいはロシア語の本あたりは、英語での review をよく見かけるのあるが、和書の英語での review は、あまり見かけた記憶がない。そういう訳で、私としては、最近意識して和書を英語で review しておくようにしている。前に『倉西数学への誘い』（岩波書店　2013）を review したし、現在同じく数学書房から出版された『小平邦彦―人と数学』（日本数学会編集　2015）の review を準備中である。山本義隆はだいぶ前に『解析力学』（朝倉書店、1998）という 2 巻本を『朝倉物理学体系』に出版しているが、聊か肩に力が入り過ぎていて、必ずしも読みやすくないのであるが、今回 review した本は、歳のせいだろうか、無駄な力みが消えて、とても読みやすい本に仕上がっている。山本義隆は『私の 1960 年代』（2015）という本で、ベトナム反戦運動や安田講堂占拠事件について奔放に語り、『近代日本 150 年―科学技術総力戦体制の破綻』（岩波新書　2018）で黒船来航以来の日本の近代化について総括している。どちらもとても読み応えのある本なので、是非一読を勧めたい。

In the 19th century physics culminated in Maxwell’s electromagnetism, which turned out to be a theory of visible lights as electromagnetic radiation (consisting of electromagnetic waves, which are no other than synchronized oscillations of electric and magnetic fields). Maxwell’s classical electromagnetism was to be superseded by quantum electromagnetism in the middle of the 20th century. Maxwellian electromagnetism is a good approximation to quantum electromagnetism, as far as we consent to do without quantum effects. {¥it Wave optics}, also called {¥it physical optics}, lies somewhere between classical electromagnetism and geometric optics. {¥it Geometric optics} is a classical approximation to wave optics, describing light propagation in terms of rays. This is valid only in case when the dimensions of the

various apertures are tremendously large in comparison with the wavelength of the light and besides we gladly agree to grudgingly refrain from examining scrupulously what is happening in the proximity of shadows or foci. Geometric optics presupposes five principles: (1) light keeps straight on in a homogeneous medium; (2) the law of reflection; (3) Snell's law; (4) if a ray of light travels from point A to point B, then it can travel reversely from B to A, (5) two rays of light are completely independent even when they intersect with each other. {¥it Linear optics} is in turn an approximation to geometric optics, holding only in the case when the various angles under consideration are so small that we can enjoy approximate identities such as

$$\sin\theta \doteq \theta, \cos\theta \doteq 1, \tan\theta \doteq \theta$$

in which we assume that the index of refraction is constant between refracting surfaces, while in general geometric optics we assume oppositely that the index of refraction is smoothly varying. {¥it Gaussian optics} is a significant exemplification of linear optics under the assumption that all surfaces under consideration are rotationally symmetric around a central axis, in which we are engaged in tracing the trajectory of the ray of light as it passes through the various refracting surfaces or is reflected by diverse reflecting surfaces. The first chapter of the classical book [{¥it V. Guillemin} and {¥it S. Sternberg}, Symplectic techniques in physics. Cambridge etc.: Cambridge University Press. (1984; Zbl 0576.58012)] deals with geometric optics from a symplectic standpoint. Roughly speaking, the book under review, inspired by the first chapter of [loc. cit.], can be regarded as a detailed account of it. The book consists of 6 chapters with an appendix on preliminary symplectic techniques. The first chapter is concerned with Fermat's principle or the principle of least time. The second chapter is engaged in Hamiltonian optics, which is geometric optics in terms of Hamiltonian mechanics. The third chapter deals with the Hamilton-Jacobi equation, beginning with Malus and Dupin's theorem (claiming that a group of rays preserves its normal congruence after any number of reflections and refractions) and then turning to the eikonal equation (a non-linear partial differential equation linking physical optics and geometric optics) and finally concludes with Huygens' principle, from which Fermat's principle follows mathematically. The fourth chapter addresses linear optics and the theory of imaging in terms of symplectic mappings. The fifth chapter discusses aberrations and caustics to go beyond Gaussian optics, where the five Seidel aberrations are discussed (cf. [{¥it A. O. Allen}, Proceedings Leeds 1 (1929); 392--401, 475--483 (1929; JFM 57.0993.05)]). The sixth chapter addresses the similarity between geometric optics and particle physics. It is argued

that geometric optics and particle dynamics are the limits of wave optics and wave dynamics respectively as $\lambda_0 \to 0$ or $\hbar \to 0$, where λ_0 is the wave length in vacuum. Just as quantization is the transmogrification of classical dynamics to quantum mechanics, the author considers the transmogrification of geometric optics to wave optics. This chapter concludes with path integrals, by which we can understand where the Fermat principle and the Hamilton principle come from.